

The infrared emission from artificial soils: the great forgotten aspect of the terrestrial greenhouse effect

Abstract

Greenhouse gases (GHGs), primarily CO₂, are well known to everyone and are designated as the cause of the greenhouse effect, global warming, and climate change. This is what emerged from the various United Nations COPs following the IPCC's advice. Hence the need for decarbonization, the energy transition to renewable energies, and carbon neutrality by 2050, the date from which we will no longer manufacture combustion-engine cars in favor of electric mobility. The number one oversight relates to a component of the greenhouse effect itself, which is a natural phenomenon. The goal is to trap infrared radiation emitted by habitable land, which averages +15°C. However, the excess infrared radiation emitted by artificialized soils creates a significant imbalance, capable of creating a greenhouse effect that overheats the entire Earth in both summer and winter. Artificialized soils include paved roads (bitumen, asphalt, and pavement layers), buildings and urban expansion, as well as vehicles exposed to direct sunlight, fixed and floating solar power plants... All of this artificialization is of a more or less dark color, with a low albedo coefficient, and a high solar radiation absorption coefficient. The overheating of artificialized soils and their thermal inertia due to their mass means that they store the heat collected during the day and release it at night; this is what I am actually experiencing and observing during the summer of 2023 in Djerba, Tunisia. The second oversight concerns the heat generated by the combustion of fossil fuels and biomass, as well as by wind turbines (friction of the blades in the air: shear phenomenon). GHGs, artificial soils, and combustion heat combine to activate global warming and allow temperature records to be broken in many regions of the world, especially in recent years.

Keywords: Greenhouse effect; Infrared emissions; Greenhouse gases emissions; Global warming, Artificial soils; Soil albedo

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Introduction

The Greenhouse Effect Anyone who has not been exposed to and heated by infrared radiation emitted by 1) a metal door exposed to direct sunlight, or 2) a wood or farm waste fire, or 3) a west-facing wall (sleeping in a room in summer near a west-facing wall exposed to the sun, or 4) touching a vertical plate placed near a wood fire, such as a three-stone stove, or 5) the heat of a fireplace, cannot truly assimilate, understand, or grasp the greenhouse effect, the primary cause of global warming. Indeed, it is the IR radiation received that heats an individual facing a door exposed to the sun and receiving IR radiation on the other side; or a person heating themselves with a wood fire in a rural field, etc.



Figure 1 Heating of the human body by exposure to a wood fire: sensation when receiving infrared radiation.

It is therefore indeed IR radiation that heats, which is in line with the three modes of heat transfer in thermal processes: conduction, convection, and radiation. Thus, among the factors that effectively cause global warming, it is the IR radiation emitted by the Earth, which is all the more exposed to the sun. In fact, natural soils induce a natural greenhouse effect necessary for life on Earth; however, artificial soils

induce an excess greenhouse effect that is enough to unbalance the Earth's radiative balance; this is referred to as "radiative forcing." Indeed, the ground and any surface that receives solar radiation absorbs too much of this radiation when they are dark in color (black in this case) and emits long-wavelength far-infrared radiation, which prevents them from escaping the Earth's atmosphere, especially since the latter is polluted by CO₂ and other greenhouse gases. With a wood fire lit in direct sunlight, we can observe the shadow of the smoke created. This shows that the main component of smoke, CO₂, partially prevents solar radiation from passing through it, creating its shadow.



Figure 2 Shadow of smoke (or a window).

During COVID-19, each time people enter a facility, their temperature is measured with an IR thermometer placed on their forehead; thus, all of humanity is supposed to understand the concept of IR radiation. Why doesn't the IPCC take into account the IR

emitted by the Earth, and more specifically artificial soils, to create the greenhouse effect and, consequently, global warming (which is not necessarily climate change). Where are the world's solar energy thermal conversion specialists telling COP 29 that the greenhouse effect is partly due to radiation emitted by the Earth and artificial soils?

During the sunny hours of summer 2023 and previous years, it's hot.¹ We feel the effect of the incident radiation, which warms us at the same time as the ambient air. The question that arises is whether solar radiation heats the air as it passes through it or after absorption by the "natural" ground and artificial soils (roads, buildings, etc.). In this case, the darker the surface color, the more it absorbs solar radiation and therefore stores more heat, which will accumulate in the following days, despite the slight nighttime cooling.²

An analogy can be made here with a solar water heater that is not used for several successive days (Figure 3).

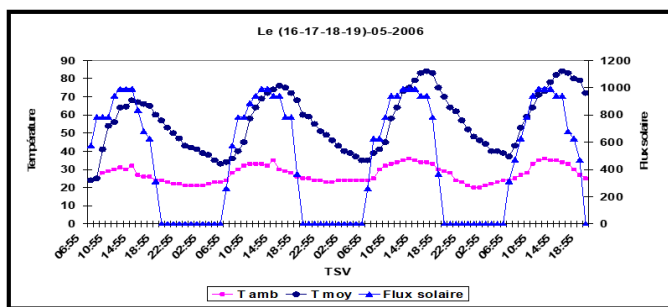


Figure 3 Evolution of water temperature in a solar water heater without tapping.²

Since IR radiation warms us, let's consider, by analogy, air pollution (particles, gases), soil pollution, ocean pollution, groundwater pollution, noise and light pollution (in the evening when cities are lit), and now pollution by infrared (invisible) radiation (IR) emitted by artificial soils. This pollution is the cause of the greenhouse effect and, consequently, global warming. Indeed, artificial soils, after absorbing sunlight, emit IR radiation that increases in intensity as the temperature rises, according to Stefan Boltzmann's law:

$$\phi = \epsilon \cdot \sigma \cdot T^4$$

And this IR radiation will be partially reflected back to Earth, by the natural atmosphere or, worse, when it is polluted. Figure 4 provides a summary of the possible causes of global warming according to my research perspective, first published in 2016.³⁻¹⁰

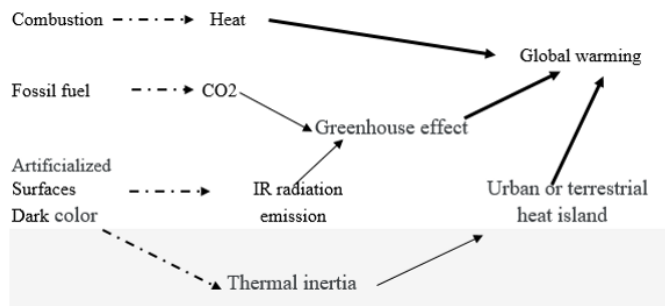
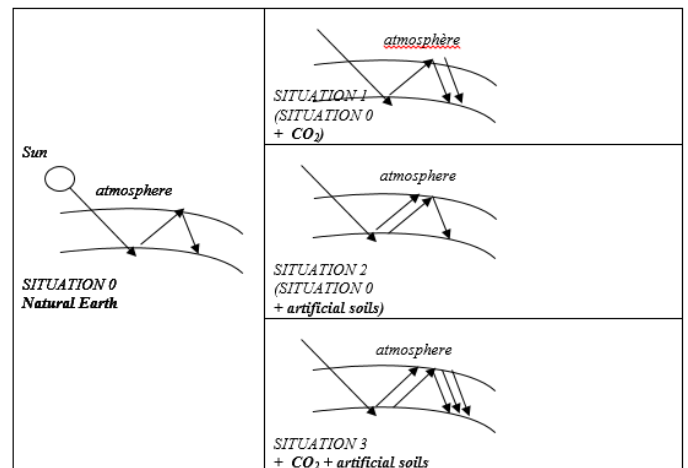


Figure 4 Direct causes of global warming.

Table 1 CO₂ and artificial soils accentuate the greenhouse effect



Why have we chosen to adapt to climate change and variability? Why not opt instead for climate change prevention? Isn't prevention better than cure? So, to prevent climate change, we must of course reduce greenhouse gas emissions, and humanity has begun to do so through the Kyoto Protocol, Rio, and the recent COP21-29 Earth Summits. Reduce CO₂ emissions, because currently no less than 23 billion tons of CO₂ are emitted into the atmosphere annually, and this figure is set to continue increasing in the coming years. No honest person can deny the impact of these 36 billion tons of CO₂ equivalent on the formation of an atmosphere that continues to trap the Earth's heat in the form of far-infrared radiation. Hence, global warming and all the harmful consequences that result from it.

As if all this is not enough, contemporary man has further amplified the phenomenon of global warming by a second phenomenon that very few scientists have mentioned, it is the infrared radiation emitted by the earth, not naturally because this is necessary and it has always existed, but rather the supplement added by the artificialization of soils (Paved roads, buildings, vehicles, artificial turf).. Indeed, they absorb solar radiation and convert it into far-infrared radiation, which is trapped by the atmosphere. In its natural state, without these artificial surfaces, incident solar radiation intercepts the Earth's soil, and a large portion is reflected back into the sky, easily passing through the Earth's atmosphere.

Solely reducing CO₂ and its equivalents is therefore not enough if we do not simultaneously reduce fossil fuel consumption and biomass, but also, and above all, limit the extent of artificial surfaces. If humanity does not simultaneously reduce energy consumption and GHG emissions (CO₂ from engines and boilers, H₂O from nuclear power, etc.), and the extent of artificial land, we must stop using gigantic photovoltaic power plants of several hundred MW, wind farms that heat the air through friction between the blades and the air, and geothermal energy, which harnesses the heat of the ground at the Earth's surface and then warms it. The only current action on CO₂ reduction is therefore obsolete.

Note:

- a) Using nuclear energy because it has the advantage of not emitting CO₂ is also not a solution, as cooling towers generate water vapor, which is a GHG, just like CO₂, etc.

b) Using solar photovoltaic (on a large scale) is also not a solution, as on the one hand, the collected electrical energy will be partially lost in the long power lines, and on the other, it is environmentally damaging, as their surfaces are dark and therefore emit IR radiation, which causes the greenhouse effect. Furthermore, more than 80% of the incident solar energy is transformed into heat. The temperature of the panels increases, causing the emission of far-IR radiation, which induces the greenhouse effect and therefore heats the environment.

In summer, global warming encourages us to use air conditioners, which consume electrical energy and thus exacerbate global warming. The energetic transition to electric vehicles is not the solution; instead, it's the vehicle that pollutes, it's the power plant itself; even solar charging stations should be excluded because they emit IR radiation, which produces the greenhouse effect: unfortunately, it's a vicious circle! The solution to this problem, which is both energy-related and environmental, is, in my opinion, twofold: energy efficiency and light colors for all artificial land. Of course, deforestation reduces the extent of carbon sinks and therefore accentuates the greenhouse effect and, consequently, global warming. Global warming is only one of the negative consequences of human actions through excessive energy use and the excessive expansion of urban development. Humanity as a whole must be more aware of the causes of global warming through the COPs (27, 28, etc.) and take actions that truly address the problem as a whole, and not just limit themselves to reducing CO₂ emissions. Finding ways to adapt to global warming (wrongly called climate change) can only be the solution for those who refuse to act. In the past, the hole in the ozone layer was addressed not by adapting to the damage it caused, but by addressing its causes: switching from Freon R22, R12 to Freon R134a, 410, etc., among others. Unfortunately, it has recently been discovered that these new refrigerants are also GHGs. There are plans to return to refrigerants R744 (CO₂) and R717 (ammonia).

It is high time to adopt truly ADEQUATE remedies that will halt the progression of global warming and return us to normal. Since we are talking about air pollution (CO₂), it is suggested that we introduce the term: IR pollution, which directly warms us. In the Holy Quran, the Creator says: Corruption has appeared on the land and in the sea because of what people have done with their own hands; that [Allah] may give them a taste of what they have done, and perhaps they will return (to Allah). Surah Romans, verse 41; this, viewed from the perspective of global warming, would mean that warming is indeed anthropological, and we are suffering some of the consequences, pushing us to reduce or avoid the causes of this warming, as was done for the ozone layer.

Causes of the greenhouse effect – influence on global warming

If we compare the greenhouse effect to that of a solar thermal collector, the greenhouse effect is due to the fact that the IR radiation emitted by a surface is reflected back to it by the glazing. The same phenomenon exists in a market garden greenhouse. For the earth, it is the atmosphere, which is even more polluted, that reflects the IR radiation emitted by the earth. Air pollution is mainly due to the gases present: CO₂, methane, etc., but also water vapor. The earth, at an average temperature of 15°C, like any body at a temperature above zero Kelvin, radiates in the far IR range. Its radiation increases with temperature, and this therefore concerns darker surfaces exposed to the sun: roads, pavements, buildings, etc., commonly called artificial land, to which we can add vehicles and other surfaces exposed to the sun. We then speak of a heat island in cities due to human activity,

which presents a difference of a certain number of degrees compared to rural areas. Aside from this, it is obvious, although not mentioned during the various COPs, the heat and the increase in temperature due to the annual combustion of these 14,000 million tons of oil equivalent.

Greenhouse gases

Greenhouse gases

There are many greenhouse gases, more than forty have been identified by the Intergovernmental Panel on Climate Change (IPCC), including:

- a) water vapor (H₂O),
- b) carbon dioxide (CO₂),
- c) methane (CH₄),
- d) ozone (O₃),
- e) nitrous oxide (N₂O),
- f) hydrofluorocarbons (HFCs),
- g) perfluorocarbons (PFCs),
- h) sulfur hexafluoride (SF₆).

The proportions of anthropogenic greenhouse gases emitted by human activities are as follows:

Gaz	Origin	Proportion
Carbon dioxide (CO ₂)	• Combustion of fossil fuels (petroleum, coal),	70%
	• Combustion of biomass.	
Nitrous oxide (N ₂ O)	• Agricultural activities,	14%
	• Combustion of biomass and chemicals such as nitric acid.	
Méthane (CH ₄)	• Agriculture (rice fields, livestock),	12%
	• Production et distribution of gaz and oil,	
	• Coal mining,	
	• Combustion of petroleum and coal,	
	• Landfills.	
Fluorinated gazes (HFC, PFC, SF ₆)	• Refrigeration Systems,	4%
	• Aerosols and insulating foams,	
	• Semiconductors industry.	
	• Fluorating gases have a heating power 1,300 to 24,000 times that of carbon dioxide and have a very long service life. This is why they represent a real danger despite the modest share they represent in total GHG emissions	

Contribution of each gas to the greenhouse effect

Different gases do not all contribute to the greenhouse effect at the same level. Indeed, some have a greater heating power than others and / or a longer lifespan. The contribution to the greenhouse effect of each gas is measured by the global warming power (GWP). The GWP is an indicator which groups together the added effects of the 6 gases contributing to the greenhouse effect which are currently taken into account by the Kyoto Protocol. It takes into account the radiative power returned by each gas to the ground (we speak of “radiative forcing”), accumulated over a period of 100 years.

This indicator is calculated using the respective GWP of the six gases considered. These GWPs are determined relative to that of CO₂, which is set at 1:

GHG	Relative GWP
Carbon dioxide (CO ₂)	1
Methane (CH ₄)	21
Nitrous oxide (N ₂ O)	310
Perfluorocarbons (PFC)	6 500 à 9 200 (depending on the molecules considered)
Hydrofluorocarbons (HFC)	140 à 11 700
Sulfurhexafluoride (SF ₆)	23 900

Source: CITEPA - Substances relating to the increase of the greenhouse effect - May 2009.

So,

- if we emit 1 kg of methane into the atmosphere, we will produce the same effect, over a century, as if we had emitted 21 kg of carbon dioxide,
- if we emit 1 kg of sulfur hexafluoride into the atmosphere, we will produce the same effect, over a century, as if we had emitted 23,900 kg of carbon dioxide.

Not every gas contributes the same way to the GWP (global warming power or potential). In 2007, the contribution of GHGs to the PRG was established in metropolitan France as follows:

GHG	Contribution to GWP
Carbon dioxide (CO ₂)	69,5 %
Méthane (CH ₄)	12,1 %
Nitrous oxide(N ₂ O)	14,8 %
Fluorinatedgases (HFC, PFC, SF ₆)	3,6 %

In addition, greenhouse gas emissions are measured in carbon equivalent. The carbon equivalent of a gas is calculated from its GWP:

- by definition, 1 kg of CO₂ is equal to 0.2727 kg of carbon equivalent, ie the weight of carbon alone in the compound “carbon dioxide”,
- for the other gases, the carbon equivalent is worth: relative GWP x 0.2727.

That is to say:

GHG	Carbon equivalent per kg emitted
Carbon dioxide (CO ₂)	0,273
Methane (CH ₄)	5,73
Nitrous oxide(N ₂ O)	84,55
Perfluorocarbons (PFC)	1 772,73 à 2 372,73
Hydrofluorocarbons (HFC)	38,2 à 3 190,9
Sulfure Hexafluoride (SF ₆)	6 518,2

Scientifically speaking, regarding global warming, we speak of the concept of radiative forcing, but commonly in public language of the greenhouse effect, which is half incorrect, because an agricultural greenhouse during the day heats up too much in the spring due to radiative forcing., in order to lower the temperature, it suffices to create a current of air when opening the doors (it is the same for cars with a sunroof).

The concentration of carbon dioxide affects the energy supply of the atmosphere; a first order approximation gives: The variation of the radiative forcing is:

$$\Delta F = 5.35 \ln \frac{C}{C_0}$$

where C is the CO₂ concentration in parts per million by volume, ppm (v) or ppmv, and C₀ a reference. Concentration, for example, 280 ppm (v) for the CO₂ concentration at the threshold of the industrial age. ΔF is the change in radiative forcing in watts per square meter (Figure 5).¹¹⁻¹⁵

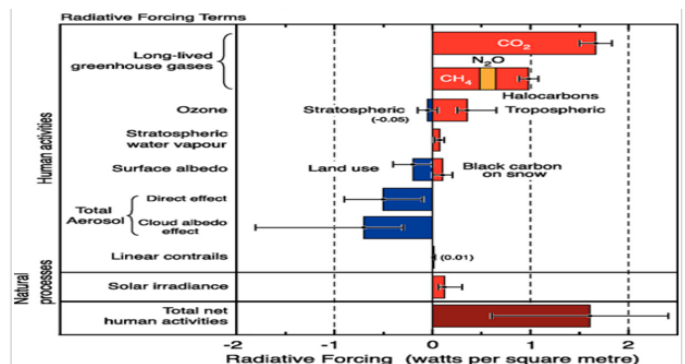


Figure 5 Radiative forcing terms.

White contrails from aircraft increase global warming. Indeed, the exhaust gases release, among other things, water vapor, which condenses at high altitudes where the temperature is below zero. In addition, they release latent heat of condensation. $Q = m \cdot L_v$ Nuclear energy is not without greenhouse gases because, while it does not emit CO₂, it does emit water vapor (H₂O) through its cooling towers, which is also a GHG, like clouds (Figure 6).



Figure 6 Water vapor from the cooling towers of nuclear power plants.

IR radiation emitted by the Earth and trapped by GHGs

As an expert in solar thermal energy, it is clear to me that the FUNDAMENTAL cause is indeed the IR emitted by the Earth (specifically artificial soils). Let's stop neglecting the main cause of

global warming and address it with the same focus on CO₂. In scientific jargon, the term used for the greenhouse effect is RADIATIVE TRAPPING. The first term, TRAPPING, is due to the atmosphere, where water vapor plays a major role, followed by other GHG's, primarily CO₂. Reducing these CO₂ emissions is the solution adopted by the IPCC and COP 27, by transitioning to renewable energy and electric vehicles to achieve carbon neutrality by 2050.

The second term, RADIATIVE, concerns the infrared radiation emitted by the earth and artificial soils, which is therefore invisible, unlike black smoke from a chimney. The physical phenomenon is well known. It is the glass or plastic covering of the greenhouse that retains the heat accumulated by trapping IR radiation emitted by the greenhouse floor following the absorption of solar radiation.

However, global actions to combat global warming (COP 21 to 28 and certainly 29) through the IPCC (Intergovernmental Panel on Climate Change) are limited to the first term by reducing GHG's emissions CO₂ and equivalents. These actions still do not take into account what actually heats the earth: INFRARED RADIATION emitted by artificialized soils (roads, pavements, dark-colored buildings, etc.) Moreover, in order to reduce CO₂ emissions, the energy transition is leading us to move beyond fossil fuels in favor of solar photovoltaics in particular. However, with small installed areas, there is no great concern, but with fields of a few hundred MW, or even GW, there will be the creation of heat islands which, as in large cities, cause an increase in ambient temperature of approximately 4°C compared to rural areas.

Observation: during COVID-19, global energy consumption decreased following the decrease in economic activity, which did indeed lead to a decrease in CO₂ emissions (see iea.org). Logically, global warming should decrease, but what has been experienced is not even a stabilization of the global temperature, but on the contrary an increase until today, and temperature records are being broken in many cities. This, and especially during the summers of 2022 and 2023, should make decision-makers around the world aware that the cause may not be in the reduction of CO₂ emissions (only) but also in the extent of ARTIFICIALIZED SOILS which should not have a low albedo coefficient and this by giving them a rather light color (simply). The scientific community of climatologists uses the term "radiation forcing," which can be reduced by increasing the albedo coefficient of surfaces exposed to the sun, such as roads (Figure 7).



Figure 7 Color contrast between a road and a track. Photos by R. BEN SLAMA.

In summer, it's usually cool in the early morning, and in the afternoon it's scorching. Let's look at the phenomenon: Under clear skies, nighttime cooling causes the Earth to lose its surface heat. In fact, its exchange with the atmosphere occurs through the emission of infrared radiation, which in the absence of clouds (GHG) is lost into the atmosphere. If, as climatologists want us to know, atmospheric pollution by GHGs (CO₂) prevents this radiative exchange, and there would be no nighttime cooling. If not, what role does CO₂ play in

reducing nighttime cooling? Given that it contributes to global warming (clumsily called climate change), the Earth would not be cooled during the nighttime. However, what we observe in terms of daytime warming is due in part to the greenhouse effect, but mainly to the storage of solar heat by the surface layer of the Earth and artificial soils, as well as the sea exposed to solar radiation. Indeed, they absorb solar radiation, especially if they are dark in color (black in this case), and store it within their mass, creating thermal inertia. It is this storage that, in the late afternoon and evening, makes buildings and cities uncomfortable (urban heat islands). Thus, to limit global warming, it is essential to limit the storage of solar energy in all artificial structures. An article published by Ansar Khan (Rooftop photovoltaic solar panels: warm up and cool down cities) shows, after a scientific study, that in cities where building roofs are covered with photovoltaic modules, there is a daytime warming of +1.5°C and a nighttime cooling of -0.6°C.²

Combustion heat

It depends on the calorific value of the fuel LHV and the quantity of mass involved in kg.

$$Q = m \cdot \text{LHV}$$

M: mass of the fuel in kg

LHV: net calorific value

Table 2 gives the calorific value of some common fuels.

Table 2 LHV of fuels

Fuel	LHV
Propane	13.83 kWh/kg
Natural gas	10.4 kWh/m ³
Coal	8.9 kWh/kg
Wood	5.5 kWh/kg
Fuel oil	12.8 kWh/l
Hydrogene	33.33 kWh/kg

Thermal inertia of artificialized soils and nighttime global warming

During the day, solar radiation heats the ambient air, the ground, and buildings. For the latter two, the degree of heating depends on the color of the surface receiving the solar radiation: the darker it is, the warmer it is. This is typically the case for roads, pavements, buildings, etc. Figure 8 shows the vehicle tire imprint on a following its depression due to heating following strong absorption of solar radiation.





Figure 8 Traces of tire dents on the road surface after vehicles were left static for a few dozen minutes while queuing to take the ferry, Ajim side (photo R. Ben Slama, the ferry, Djerba, Tunisia, July 2023).

With the expansion of these last two factors: roads and buildings linked to urban expansion, the heat stored during the day is increasing, resulting in warm nighttime periods (in the absence of solar illumination). Thus, the Earth, which should cool down thanks to nighttime cooling, has partially lost this natural phenomenon, and artificial soils retain the day’s heat for the night. Thus, the rise in temperature due to solar energy absorbed during the day will add to the morning temperature (which is no longer low!) to reach record temperatures in the afternoon, attributing the phenomenon to the greenhouse effect. In fact, the thermal inertia of artificial soils, in addition to natural soils, has contributed significantly to reaching record high temperatures in the afternoon. This phenomenon will worsen in future summers following the expansion of artificial soils. The remedy is therefore to act on the very cause and not to put everything on the increase in CO₂ concentrations as if it were the only GHG, while the H₂O composing clouds has always been the most frequent and will always be. It would therefore seem that by blaming only CO₂, following the combustion of hydrocarbons, carbon neutrality in 2050, manufacturing only electric vehicles from 2030, the use of photovoltaic power plants with a few hundred MW of power is in fact once again nothing more than technological domination on the part of industrialized countries and an embargo against oil-producing countries which, as seen at COP27, are trying to push back the carbon neutrality deadline beyond 2050, or even 2070. The thermal inertia of the ground influences the temperature evolution of the surrounding environment (Table 3).

Table 3 Sensational changes in ambient temperature in midsummer

Temperature	Morning 6 am.	Noon 12 pm.	Afternoon	Evening	Dawn
Air ambient	→	→	↗↘	→ acceptable	↘
Soil at 40 cm	→	→	→	→	→
Building	WON WCN	→	→	→	WON WCN
Mains water	→	→	→	→	→
Buried tank water	→	→	→	→	→

WON, Window open at night; WCN, Window closed at night

Personally, the mains water from the meter is 260 m away from my house and is conveyed through a PEX pipe buried at a depth of 30 to 40 cm. This water is relatively warm in the morning compared to the ambient air outside. However, in the afternoon, this water is relatively cool compared to the ambient air outside. The temperature indicated in the table 5 is at a depth of 40 cm. Thus, for underground areas (wells, Majin, etc., 5 to 30 m deep), the water temperature is similar to ambient temperature in the morning and night, but very cool from noon until evening. The opposite is true in winter.

The maximum incident solar flux is in June (the 22nd), while the maximum temperature is in July-August, due to the thermal inertia of the earth (natural and artificial soils) (cold season followed by warm season). Similarly, the minimum incident solar flux is in December (the 22nd), while the minimum ambient air temperature is due to the

thermal inertia of the earth (warm season followed by cold season). On July 25, 2023, at sunrise at 5:30 a.m., waves of warm air arrive with a light wind. This shows that the land, the sea, and the artificial soils have partially stored the heat from the previous day and previous days. This storage is all the more important when the surface color is dark. The land and sea have always existed without reaching high ambient temperatures during the day. Therefore, the excess heat caused by artificial soils is consequently responsible for the high temperatures reached during the day. This global warming is clearly due to dark-colored artificial soils that absorb sunlight and store it for several days. The temperature reached increases day by day. This Tuesday, July 25, 2023, and throughout the summer, if you touch a wooden door, you will feel that the outside is hot, the inside rather cold. If the door or window is metal (steel, aluminum), it becomes untouchable (temperature above 60°C). The air, with a light southerly wind, quickly heated up even before 9 a.m. and continued until the end of the day. As for agriculture, everything dries quickly after watering, figs and grapes are burned (scorched) by the sun and the hot air from the southwest. They tend to die before ripening!

Remedies

Remedies are closely linked to the causes.

When we think we can solve a problem with solution x and it doesn’t work after so many years, it means that solution x isn’t correct and needs to be changed. The same goes for global warming. If the reduction of CO₂ emissions during COVID-19, all the efforts to transition to renewable energy, and electric vehicles, have not mitigated global warming; on the contrary, it continues to increase, then the real cause must be sought elsewhere. I’m thinking of the ever-increasing IR emissions from artificial land, as well as the storage of solar heat by buildings and cities. Thus, the building sector is the world’s largest energy consumer; it could be the primary (or one) cause of global warming, as it stores solar heat through its mass, which creates thermal inertia overnight, or from one month to the next.

Reduce CO₂ emissions

This is well known to all of humanity, as all the COPs mention it and talk about decarbonization, carbon neutrality, carbon footprint, and ultimately, the term: moving away from fossil fuels, whereas at the end of the last century, we were talking more about moving away from nuclear power. COP 28 and 29 were marked by the dialogue on the final report to be presented by the organizers. The use of electric vehicles is one of the solutions adopted to decarbonize. However, this can only be true if electricity is also produced carbon-free (renewable energy, nuclear...), otherwise, overall, it’s as if we haven’t decarbonized anything. We then talk about a low-carbon economy.

Reduce energy consumption

Even nuclear power, which sends water vapor (GHG) into the cooling towers, but whose electrical energy produced, as well as the heat evacuated by the cooling towers (condenser), is then transformed into heat, which increases the ambient air temperature.

Reduce the extent of artificialized soils

The objective is to limit IR emissions from these soils but also their heat storage following the capture of solar radiation and to avoid the dreaded heat island.

Reduce IR emissions from artificialized soils

In winter, Jean Félix used a mirror to heat his house on the north side; on the south side, however, it is heated by a Trombe wall or solar collector.

In summer, to protect the house from incident solar radiation, it might be a futuristic idea to consider using a large parasol on the house to protect it from solar radiation. This parasol could be unusual, for example, a large helium-filled tarpaulin that will be suspended over the building to protect it from the midday sun, especially in low latitudes. Also, white paint is preferred to avoid absorbing solar radiation. Similarly, asphalt and tar removal are used to reduce the absorption of solar radiation by increasing the albedo coefficient, for public spaces, sidewalks, roads, highways, etc.

Reducing the absorption of solar radiation not only reduces IR emissions from the soil but also limits its thermal inertia, preventing the soil's heat from being stored and released until nighttime, or even the next day; similar to a solar water heater. Deciduous trees, green terraces, and shade structures aim to reduce the absorption of solar radiation by the soil and thus limit its warming. Table 6 summarizes the cumulative effects of harmful human actions on the environment and the resulting disastrous global warming.

Reduce the thermal inertia of the soil (daytime heat for the night and subsequent days)

Table 4 Recapitulates

Naturally	One century ago	Clean atmosphere + Terrestrial infrared radiation at 15 °C	Desired greenhouse effect for the life on the earth
Humann Modification 1	Effet of combustion product CO2	Clean atmosphere + CHC ₂ 35.10 ⁹ tCO ₂ e + Infrared Radiation at 15 °C	Imbalance. Increase of the Green House Effect → Global warming 2 to 6 °C/century
Humann Modification 2	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 CO2 + artificialisation of the floors	Clean atmosphere + Green House Gazes + Infrared Radiation at 15 °C + Radiation from artificialized floors	Imbalance. Increased greenhouse effect → Global Warming? at? °C/century
Humann Modification 3	Heat of combustion Effect 15 000 Mtoe LHV = 10 kWh/ litre	Atmospheric air heated Cp _{air} = 1000 J/kg°C	Air heating 0.12 °C/year
Humann Modification 1+2+3	Effect of combustion product CO2 + artificialisation of the floors + Heat of combustion	Clean atmosphere + Green House Gazes + Artificialized floors Radiation + Artificially atmospheric Air heatid + Infrared Radiation at 15 °C	Imbalance. Definitely increased Green House Effect Nettement accre → High Global Warming ?? 2.22 °C/century
Stop	Ground Craze	By the human action	

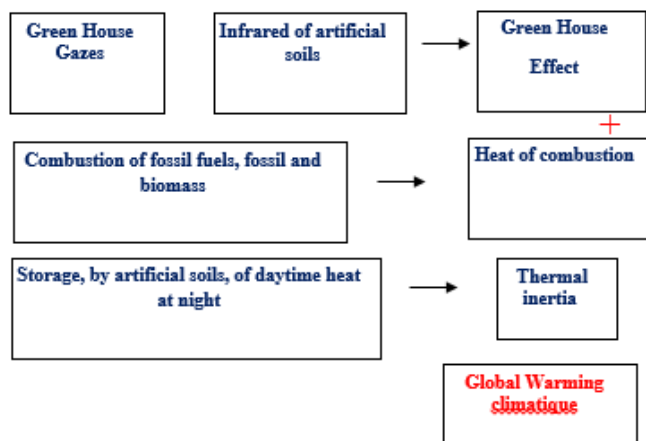
Conclusion

In addition to the need to reduce GHG's emissions, three other necessary actions must be taken. - First, reducing GHG's emissions is well known; it is necessary to reduce the greenhouse effect. - However, the greenhouse effect only occurs through infrared emissions, particularly artificial soils. It is infrared radiation that is trapped by greenhouse gases, and this is scientifically referred to

as radiative imprisonment (also in Arabic: *يدراح سابتح*). These infrared emissions can be reduced by avoiding dark colors on surfaces that receive solar radiation; this will increase the albedo (roads, pavements, courtyards, sports fields, vehicles, etc.). - Another factor that directly heats the Earth's atmospheric air is the combustion of fossil fuels and biomass, and in reality, almost all energy ultimately turns into heat. This contributes to heating the Earth's atmosphere,

accelerating global warming. - The fourth factor is the storage of heat from daytime (in the presence of the sun) to nighttime: artificial soils store a large portion of the daytime heat under the effect of sunlight, releasing it at night. Day by day, the temperature increases in summer despite the decrease in daylight and solar flux.

Read the following table, then horizontally vertically.



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