# Heat Pollution and Safeguards for the Paris Accord and the U.S. Climate Change Plan

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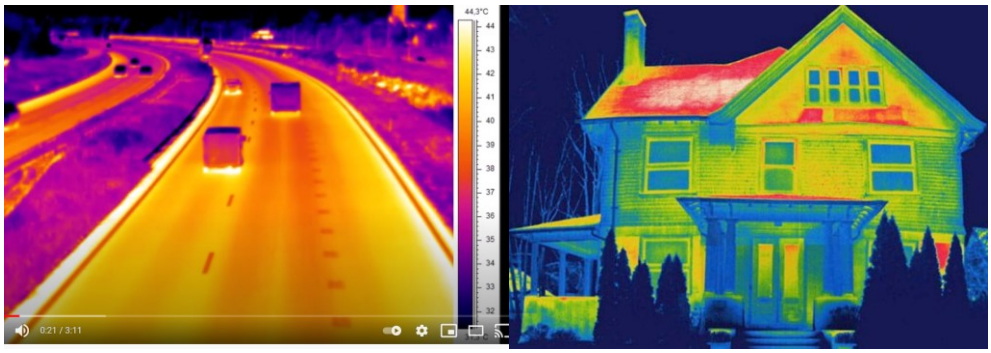
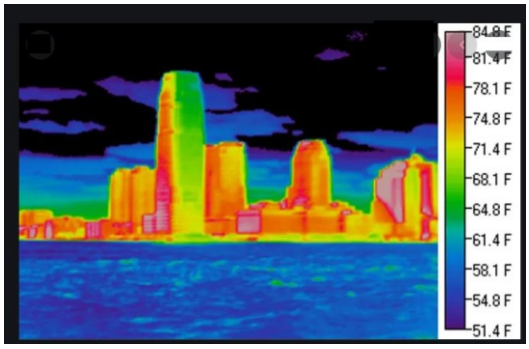


**Heat pollution** is the increase in global warming primarily from how Man is adding heat by darkening the planet with black roads, black roofs, and unreflective large cities. Dark unreflective surfaces convert the Sun's energy to heat. It is not difficult to understand that any manmade new heat added to the planet will contribute to global warming directly. Climatologists assess this as a land-cover/land-use effect, but we use a simpler new term in this article - **heat pollution**. Therefore, **heat pollution** is not a theory, it is an accepted problem and recent studies suggest it accounts for over 25% of manmade related global warming as explained in this article. **Heat pollution** occurs most of the time by our use of dark colors. Black is the worst since it is the highest absorbing color of the Sun's energy and creates the greatest increase in solar heat. Alternately, white is the best as it reflects sunlight. Any new **heat pollution** contributes to global warming and is not debated by climatologists. **Heat pollution** also can include heat from wartime explosives, nuclear bomb tests, black cars, fossil fuel heat, etc.

The Earth's natural reflectivity is about 30%. Black roads and rooftops reduce this reflectivity which effectively pollutes the environment increasing warming every day. We might think of it as adding garbage to our land that adds up every day. It piles up and reduces the Earth's reflectivity system which increases global warming. **Heat pollution** is also amplified since when heat is added about 60% is re-radiated back to Earth by the greenhouse effect. Added heat is also amplified by Mother Nature's feedback effect discussed below.

**Large Cities:** Most cities contain black roads and black rooftops along with dark sides of tall buildings that increase the solar surface area and city heating. These buildings trap solar heat, block wind, and amplify **heat pollution** in numerous complex ways. Because cities are very hot, they are often called Urban Heat Islands (UHIs). Climatologists constantly debate how much

cities, roads, and roofs have contributed to global warming compared to CO2. A recent study [1] found about 13% of gross global warming is due to UHI **heat pollution,** meaning over 25% is caused by man (explained below). Other authors have found similar recent results [2, 3]. There have been numerous older studies that have found higher levels.




## Feedback and Heat Pollution

Climate change feedback is the response of Mother Nature to the warming created by man. For example, one type of manmade global warming feedback response by Mother Nature is ice and snow melting which reduces the reflectivity of the Earth and causes more warming. Although not fully understood, climatologists anticipate that feedback is greater than 50% [4]. As an example, since recent studies suggest that **heat pollution** is about 13% [1], assuming feedback is 50%, then CO2 and other greenhouse gases would be 37% of global warming; Looking at just man's contribution, **heat pollution** is 26% and CO2 and other greenhouse gases are 74%. This is then amplified by Mother Nature's feedback effect.

## An Alternative to Heat Pollution is Earth Brightening

Common simple methods to brighten and increase the reflectivity of the Earth [5, 6] are:

- Cool Roofs (greater than 30% reflectivity, such as a white roof compared to a black roof)
- Cool Roads (greater than 30% reflectivity, such as using a lighter colored concrete vs. a black asphalt road)
- Improve city design to reduce **heat pollution**

## Heat Pollution Designs Illustrate the Need to Increase Awareness

Black electric cars demonstrate a strong example of our lack of understanding, and illustrate the need for **heat pollution** awareness. An electric car that is black increases global warming more than a white gas car exposed to the Sun in a parking lot each day as millions of such dark electric

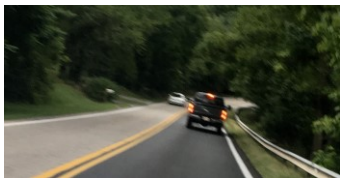
vehicles from auto designers that reduce CO2 emissions will also increase solar heat pollution, creating more problems for the environment than their intended purpose. The **Department of Transportation (DOT)** is one of our largest contributors to **heat pollution** in their use of black asphalt roads. Some city designers have tried to convert to cool roofs but it is a low percentage and even less work has been done in the area of cool roads. While **heat pollution** is easier to understand than greenhouse gases, most designers are unaware of the environmental damage created by the mass production of cars, roads, and rooftops. We have large fines for littering the environment, yet **heat pollution,** which threatens our environment, is unregulated despite a global warming crisis. We should assess fines for **heat pollution**.

## Safeguards for the Paris Accord's Consideration

The Paris Climate Accord currently does not include any mention of **heat pollution** restrictions. As well there are two well-known alternative methods to reduce global warming using **Earth brightening** [5, 6] ((improving the reflectivity of the Earth), and **Sun dimming** [5, 6] (blocking some sunlight in the upper atmosphere). Issues of concern to climatologists regarding the Paris Climate Accord are:

- The agreement allows for the continual increase in **heat pollution** worldwide.
- We cannot be 100% sure CO2 reduction will work. We can anticipate a high probability that fossil fuel reduction will not be enough. There is a high level of concern that CO2 reduction will be too late due to Mother Nature's feedback (forest fires, snow and ice melting, etc.). CO2 reduction may not even be enough to combat **heat pollution.**
- There are no coordinated plans to reverse global warming, but only to reduce it.
- It is very concerning that **heat pollution** safeguards are not included. The agreement depends solely on CO2 reduction to slow global warming. This precaution is not enough as high-levels of forest fires increase, drought occurs, and record-high temperatures persist.

President Biden's plan, for example, could benefit from **heat pollution** restrictions. There are no provisions for alternate global warming solutions and his budget does not provide for any safeguards for CO2 solutions. His plan for funding roads and the new construction of highways is expected to contribute to large increases in **heat pollution** as DOT darker new roads continue adding heat to our environment.



We recommend at least 50% of US funding should go towards reducing **heat pollution, Earth brightening** [5, 6], and **Sun dimming** [5, 6]. These are extremely difficult to implement and we suggest immediate help from an agency like NASA to coordinate and implement plans. Furthermore, CO2 reduction is a slow process where **Earth brightening** and **Sun dimming** provide immediate reversal results.

## A Plan with Safeguards Would Include:

- Requiring black roads and black roofs to have a reflectivity of 30% or greater
- Assessing fines for adding heat pollution
- Improving city designs to reduce **heat pollution**
- Plans to include **Earth brightening** and **Sun dimming** [5, 6]
- Reduction of greenhouse gases
- Redesign of the Paris Accord to include these safeguard assurances

## References: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   Private Communication from author Guoyu Ren "We have a paper published in the Journal of Climate last year, showing about 13% urbanization effect in the global land surface air temperature trend estimated for the last 70 years. You could find it on my profile of GR. This is a complex issue, and we are going to make further investigation using more complete data."
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