**Global Dimming and Brightening**

**Dimming**

Causes:

* Increase in air pollution from human activity (combustion of fossil fuels – by products)
	+ Increase in aerosols that reflect and absorb radiation before it reaches the planet’s surface
	+ makes clouds brighter and longer lasting (water droplets containing pollution), meaning they reflect more sunlight
	+ Vapors emitted by planes increase heat reflection and hence also global dimming

Consequences:

* Masked part of historical warming caused by greenhouse gases (areas that have undergone brightening have shown increases in temperature)
* Global warming means increased amounts of water vapor are present in the atmosphere, which absorbs some of the radiation before it reaches earth’s surface, enhancing dimming (Cooling effect of this is unlikely to reduce the overall warming trend)
* Theoretically, global dimming has a cooling effect on Earth, however temperatures are rising. It is believed, that temperatures would be much higher without global dimming.
* Pollutants causing dimming also cause acid rain, smog and respiratory diseases.
* Reflection of solar energy has caused water in northern hemisphere to cool, hence less water evaporates and causes disruption in rainfall patterns??? – monsoon in sub-Saharan Africa disrupted, causing hinger and famine due to crop destruction amongst other things.

Evidence:

* China and India have seen dimming, which correlates to increasing pollution due to industrialization.
* In the 1990’s laws concerning air pollution due to combustion of fossil fuels were made harsher, thus global brightening (the opposite of dimming) occurred.
* Overall average drop of 22% of sun’s energy reaching Earth (Antartica least affected, Russia, Europe and USA more so)
* Southern Hemisphere – low levels of dimming; northern hemisphere – more significant reductions (4-8%)

Opinion:

* Global dimming (cooling of the earth due to increased pollutants in the atmosphere that absorb and reflect the suns energy) is the opposite of global warming (warming of the earth due to increased greenhouse gases that trap sun’s energy within the atmosphere).

**Brightening**

Causes:

* Reduction in aerosols (absorbing and reflecting) since 1990 – less pollutants in clouds and the atmosphere led to decreased reflection of sunlight and thus and increased amount of sunlight reaches the earth, in effect brightening the earth.
* Clean-up of air pollution, especially in Europe and Russia (industrial decline as well as harsher laws
* Changes in cloud cover

Consequences:

* Decrease in air pollution, less disease due to smog, less acid rain
* Normalization of rain patterns
* An increase in average temperature due to increased sun energy reaching Earth’s surface
* More sunlight reaching the Earth’s surface (warming effect)
* More radiation is able to escape back into space and less absorbing aerosols trap less heat within the atmosphere (cooling effect)

Evidence

* Carbon Dioxide lasts in the atmosphere for over a century, whereas aerosols usually only last a few days, meaning increasing aerosols is not an adequate solution to combat global warming caused by greenhouse gases such as CO2.

**Opinion**

Both concepts are valid, but have to be considered with both in mind. One cannot solely argue that one is correct and another is not, as both exist. There is variation amongst global regions, as in Europe for example dimming has been reversed to brightening due to decreased aerosols. However, in countries such as India and regions such as Africa, where less environmental laws exist and industrialization is still occurring, dimming is evident. Extremes of dimming as well as brightening are harmful for the environment and well as humans and cannot be seen as solution to decrease the rate of global warming, despite there being a correlation between the two. One has to bear in mind that greenhouse gases, and the enhanced greenhouse effect are a more long-term issue than air pollution in form of aerosols, and consequent dimming or brightening, as aerosols stay in the atmosphere for a much shorter amount of time. All of these issues have to be addressed together, and not one singled out to be the solution to another.