Electronic supplementary information:

I Typical insolation from satellite data

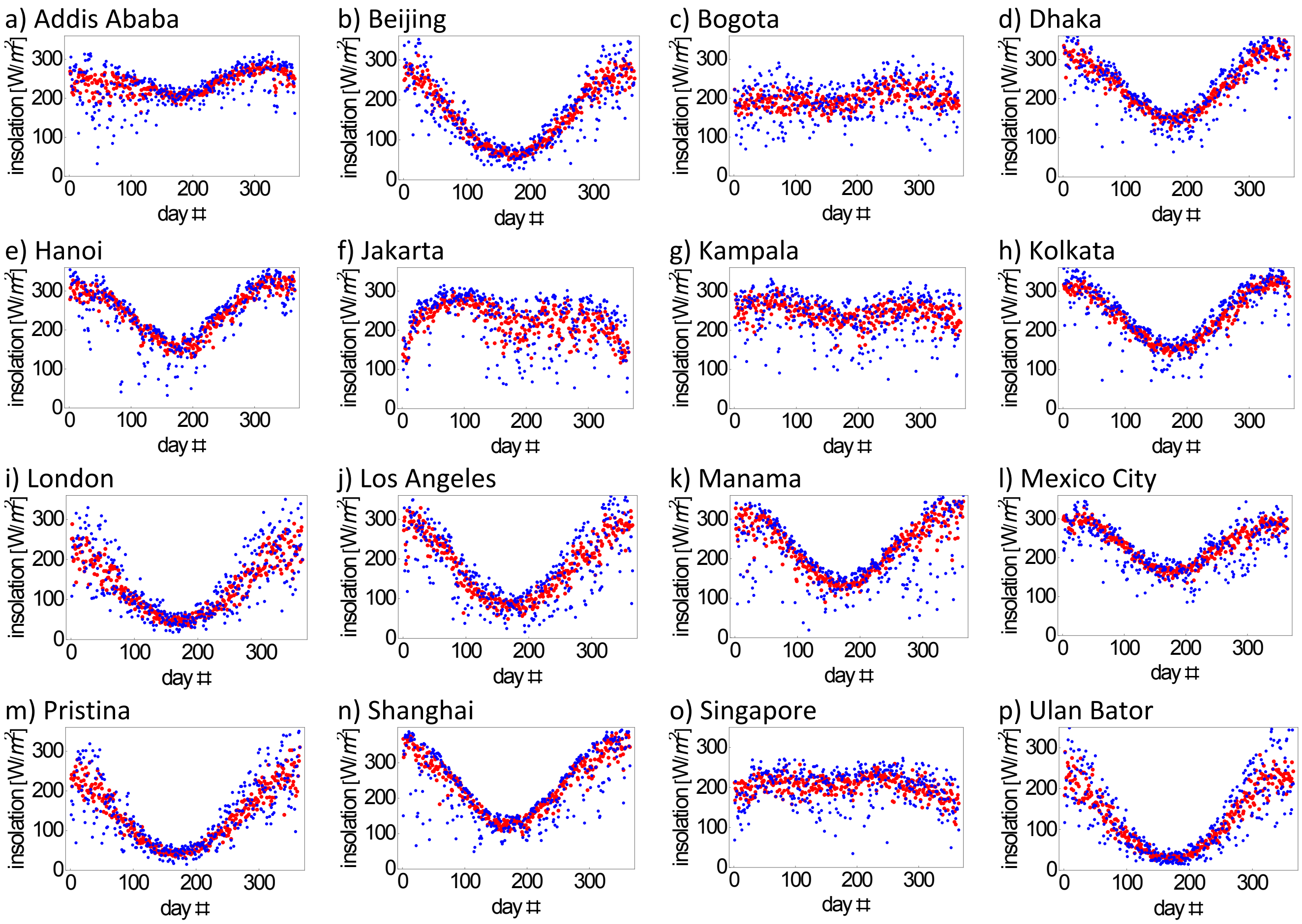

Figure S1: *Median insolation based on 10 year insolation data from NASA for each day of the year and the 16 cities considered in this study (red). This data was used to estimate insolation losses due to fine particulate matter. Also shown is the insolation data for one year (2014) for comparison. Note that all given values are average insolation values for one day.*

II Correlating PM2.5 and Insolation

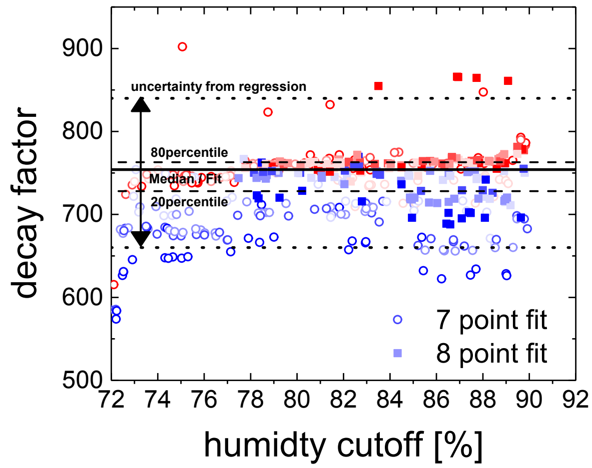

Figure S2: *Monte-Carlo analysis of the exponential decay factor for varying conditions of data sorting and analysis.*

There is a choice of parameters when it comes to sorting the insolation data for different PM2.5 concentration conditions, which affects the exponential decay factor in **equation 1**. In **Figure S2** we show a Monte Carlo analysis of how the decay factor varies when several of these factors are varied randomly. The x-axis of the figure corresponds to the humidity-cutoff factor. Humidity is used as an indication for rainy days. As can be seen, no results are shown for cutoff factors beyond 90%. Including days with very high humidity results in a failure of the fitting routine. On the other hand, reducing the cutoff factor to below 78% eliminates so many data points that fitting up until a PM2.5 concentration of 400 $\mu g/m^3$ becomes impossible. This is indicated by the shape of the points in **Figure S2**. Rectangular shapes indicate that 8 points (i.e. concentration until 400 $\mu g/m^3$) were considered, whereas round shapes indicate that 7 points (until 350 $\mu g/m^3$) were considered. Overall, however, little dependence is found on the humidity cutoff. The value used in the analysis is 80%.

A stronger dependence can be seen on the percentile that was used to define clear-sky conditions. This filter is used to obtain a typical daily curve from the set of points at each hour and each PM2.5 concentration conditions (compare **Figure 3a**). The default value here was 0.8. Blue colors indicate a smaller value, red values a larger value. The goal here was to use a factor that was as large as possible without being influenced by outliers. As can be seen, the median value (solid line) is very close to an upper boundary beyond which only lie very few points. The default value was chose such that the result coincides with the median value. Other factors did not show a significant impact on the result.

Overall, we find that the vast majority of all points (>95%) lies within the range that the regression gave as confidence interval when fitting the linear decay for the chosen conditions. Hence, we used this confidence interval in the analysis.

III PM2.5 concentration and aerosol optical depth (AOD) in Delhi.

One goal of this study was to show the impact of anthropogenic air pollution on the yield of solar panels. Air pollution is frequently recorded using quantities like PM2.5 and PM10 concentration, or the air quality index (AQI). Neither of these quantities are good descriptions of the optical properties of the haze cloud hanging above a city. One assumption in the presented study include that cities have typical haze events that can be described by surface-measured PM2.5 concentrations in a statistically relevant way. Optical properties of aerosols are described in meteorology by another quantity, the aerosol optical depth (AOD). AOD is a unit less quantity that describes the extinction of the solar beam due to dust and haze. AOD is typically given for the entire atmospheric column, but sometimes also as a function of atmospheric layers. The most reliable source of AOD data is the Aerosol Robotic Network (Aeronet), a group of ground-based remote aerosol sensors networks established by NASA, the University of Lille 1, CNES and CNRS-INSU [76]**.** Unfortunately, Aeronet data for Delhi was not available for the years 2016 and 2017, in which the majority of insolation measurements were taken. A new Aeronet station was launched in 2018 with consistent data generated since February. We expect that by mid-2019 sufficient data will be available to allow a comparative analysis of insolation, AOD and PM2.5 concentrations.
Another source of AOD data are satellite measurements. The issue with satellite based measurements is the comparably low temporal and spatial resolution, as well as uncertainties in the data processing. To illustrate the challenges with using this data, we have accessed data from the MODIS instrument of NASA [77] and used AOD data for the region around Delhi. There are two observations, Illustrated in **Figure S3**, we can present using this data:

i) Using the same methodology as for the PM2.5 data, we find a correlation between AOD and a reduction in solar insolation. Over a period from May to November we project a 22% reduction in insolation due to aerosols in the atmospheric column. This result is consistent with numbers from Husar, Gueymard or Li [59 - 61].
ii) Directly comparing AOD and PM2.5 concentration, we find that the two quantities are only weakly correlated. A Pearson test gives a slightly negative correlation of about -0.1 between PM2.5 concentration and bot AOD and log (AOD). Difficulties to correlate AOD and PM2.5 concentration are known in literature and have been shown, for example, in [78].

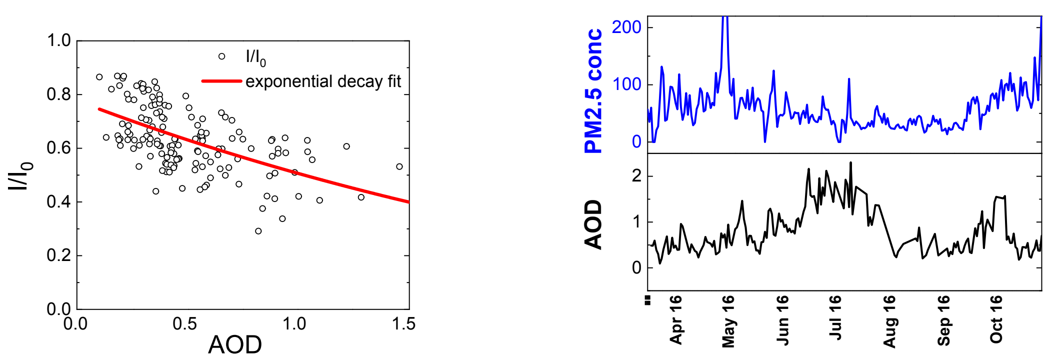

Figure S3: *left: reduction in insolation as a function of satellite AOD. A reduction in insolation with increased optical depth is apparent. Using this data, we project a 22% reduction in total insolation). right: satellite AOD and ground PM2.5 for Delhi between May and October 2016. A Pearson test results in a weak anti-correlation (~0.1) between PM 2.5 concentration and both AOD and log(AOD).*