

Using satellite observations to determine rural areas with higher health risks

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PM2.5 is particulate matter smaller than 2.5 microns of diameter, which is 20-28 times smaller than that of a human hair. Prolonged exposure to concentration levels above 10 Mg/m³ of this type of air pollution increases the risks of cardiovascular diseases by 95%, according to the World Health Organization (WHO).

Sources of PM2.5 include biomass burning and industrial activities. Rural households often burn biomass for cooking, which expose people to high concentrations of particulate matter. On the other hand, oil & gas fields, also tend to be located entirely in remote regions.

Often, the air quality of these remote locations are not monitored on ground, even in countries with the highest number of ground monitors -such as the USA. Satellite-derived observations can be particularly helpful for remote regions, since they allow to estimate the concentration levels of PM 2.5, identify the regions with highest health threats, and monitor progress.

This research supports the United Nations Sustainable Development Goal 3 (Good Health & Well-Being) & 11 (Sustainable Cities and Communities) -both of which specifically address air quality using PM2.5 concentration levels as an indicator. It was generated using the skills gained on recent certified NASA training on creating air quality data sets derived from satellite observations.

As a voluntary collaborative partner to the Monterrey Metropolitan Area Air Quality (OCCAMM) Citizen Observatory, and to the Team 54 Global Quest for Africa Project, the following countries were chosen for this case study: Nigeria, Burkina Faso, and my home country, Mexico. Figure 1 shows the annual mean estimates for PM2.5 concentration levels in Mexico, highlighting darker colors for areas with higher concentrations of this type of air pollution. Notice that the region around rural areas in the south east show alarmingly dangerous high levels of concentration, which pose a huge threat to the health of locals. These regions are also where major oilfields are located. Figure 2 shows the annual mean estimates for PM2.5 concentration levels in Nigeria, and demonstrates that rural areas have the worst air quality in the country. The same is observed for Burkina Faso in Figure 3.

PM 2.5 also contributes to global warming, and as such, to climate change, which poses the largest threat to humanity in history. We must be aware of the sources of greenhouse gas emissions around human settlements, monitor the quality of the air we breathe, and address the urgency of implementing new climate adaptation & mitigation plans around the world. There is an acute relationship between climate change & health, and not taking action comes at a cost far higher than the upfront costs of addressing the needs for clean technologies.