

Which is More Polluted, Delhi or Beijing?

This question seems like an ill-advised race to the bottom, but does deserve an answer, as previous attempts to settle the matter have ignored the real complexities of air pollution. Comparisons based on annual average pollution concentrations, such as presented by the World Health Organization ignore the fact that the intermittently occurring severe days have strong human health effects. Comparisons based on individual days ignore the effects of different weather conditions in the two cities. These comparisons are facilitated by web sites such as <http://aqicn.org>.

The only statistically meaningful comparison is through a comparison that covers a wide range of conditions over a time span long enough to produce statistically meaningful conclusions. The primary tool for this is a comparative plot of data percentiles of pollution at two representative locations in the cities in question. These locations are not directly affected by pollution from individual large sources such as industries or traffic intersections. They can thus be considered representative of city-wide atmospheric conditions.

The accompanying figure is based on two years of hourly average PM2.5 concentration data in micro grammes per cubic metre from the R.K. Puram pollution measurement station in Delhi, and the U.S.A. Embassy station in Beijing. These data are collected and managed by relevant pollution regulation agencies, and are subject to rigorous quality checks. Data as percentiles are plotted as black dots, and the diagonal line indicates exact equality in pollution concentrations. Numbers below the dots show percentiles. For example, the 80th percentile is the pollution concentration at which 80% of conditions are worse, and 20% better, and so on.

Because the plotted dots are all below the diagonal line, Delhi is more polluted for all percentiles, no matter what time average is used. The upper 17% of conditions in Delhi are hazardous, while 7% of conditions in Beijing are hazardous. Unpolluted conditions are found in Delhi for less than 1% of the time, while such conditions exist in Beijing approximately 8% of the time.

Colour shading on the graph indicates the severity of PM2.5 pollution based on worldwide accepted standards as laid out in <http://www.airnow.gov>. Unpolluted conditions are indicated by the green square. It is thus evident that both Delhi and Beijing are unacceptably polluted for a large fraction of time, and that their citizens are subjected to pollution related health effects. This fact makes irrelevant any pollution comparisons between the two cities.

Citizens and government in both cities should be working together aggressively to improve this unacceptable level of pollution. The costs of such pollution are enormous drains on national and local budgets, but sadly these costs are not included in economic analyses. The costs of pollution reduction are far smaller than the costs of pollution damage, and simple technological solutions are readily available. What is needed is political will, which can only come from an informed and actively engaged population.

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