Air quality improvement: Managing Sources and Sinks

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With the withdrawal of the summer monsoon season, everyone gets concerned about the air quality, particularly in Delhi-NCR. So what happens around the beginning of October that starts deteriorating air quality? The satellite images show some cases of stubble burning but is this is the sole reason to blame for the poor air quality in Delhi-NCR. Let us look at this issue of air quality from a different perspective. When we say that air quality is getting into 'poor' from the 'satisfactory' category, so we are referring to the increasing concentration of particulate matter and other pollutants in the air. Therefore, here comes the concept of the residence time of these particles and pollutants in the air. It can be thought in terms of a budget of these airborne particles (aerosols) and gases in the air around us (in lower troposphere). In other words, the concentration of these pollutants in the air at a given place at any given time is equal to the 'source minus sink' for that particular place at that time. Now, if the source dominates over the sink process then air quality starts getting poor. On the other hand, the enhanced sink process can reduce pollutants' concentration. The sources of these particles and pollutants are from industry, transport, power plants, agriculture (waste burning), domestic, construction, wind-blown dust, and other natural sources. Sinks include the precipitation (rainfall), gravitational settling, ventilation by winds, and other transformation processes. Looking at the lists of sources and sinks of pollutants, we note that the majority of sources are man-made, while the majority of sinks are natural.

So, the question that how we tackle the issue of poor air quality? Looking at the simple calculation of 'source – sink', we must reduce the strength of sources and enhance sinks. This is interesting. The matter of air quality improvement is nothing but to manage the source to sink balance in the given geographical and meteorological/atmospheric conditions, which are not in our control.

The proportions of different sources contributing to the concentration of particles and other pollutants at a location (including the advection) have temporal (mostly seasonal) variations. In addition, these sources differ from one place to another. Depending on the status of air quality, the Government implements different strategies to control pollutants' concentration. These strategies target to manage major sources of pollutants over that region. For example, the even-odd formula for personal vehicles, banning construction and shutting down coal-based power plants for a few days, etc. But, in recent years, there are new ideas coming up to strengthen 'sinks' of air pollutants. Apart from the conventional sinks (e.g. water sprinkling on roads/trees), the modern 'innovative sinks' are being developed such as dust-suppressors, anti-smog gun, smog-tower, and a variety of large air-filtering systems at traffic junctions and busy highways. These new methods of enhancing sinks of the air pollutants are in experimental stages but we hope that these devices will help in improving the air quality in the coming years