Exclusive Content

YP Perspective

Global Efforts to Improve Air Quality

By Ryan Christman

Perhaps one of the most pivotal moments in human history was the dawn of the Industrial Revolution. The birth of the modern assembly line, developments in the iron and steel industry, and the industrialization of the steam engine gave way to economic prosperity and raised the standard of living for many people. While the economic and social impacts produced by the Industrial Revolution were positive, many of the industrial processes developed during and subsequently expanded upon over the following decades have had and continue to have a marked impact on global air quality. In a 2014 statement issued by the World Health Organization (WHO), it was estimated that approximately 7 million deaths in 2012 were caused by air pollution-related health effects.[1] A 2013 study conducted by MIT found that air pollution causes nearly 200,000 premature deaths per year in the United States with the majority of the air pollution coming from industrial flue-gas stacks, vehicle exhaust, and power generation.[2] As the knowledge of air pollution-related disease and premature deaths became more prevalent, governing agencies across the globe began to take strides toward improving air quality.

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In Beijing, for example, public awareness of the severity of air pollution in the country saw a sharp increase in 2013 after the Air Quality Index level hit an unprecedented 755 (the theoretical maximum value is 500).[3] While the WHO states that no more than 10 µg/m^3 is to be considered safe for $PM_{2.5}$, China has vowed to meet an interim standard of 35 µg/m^3 for $PM_{2.5}$ by 2035.[4] Though that is an aggressive target, some areas in China have already begun to make noticeable progress. The 2016 average ambient air concentration of $PM_{2.5}$ in Beijing was 73 µg/m^3, which is an almost 10-percent reduction from 2015 levels (a small change, but progress nonetheless).[5]

Ryan Christman, M.S., is an air quality engineer and environmental management information systems specialist with experience in the oil and gas industry and the solid waste industry.

Other nations have also vowed to take action to gradually reduce the ambient concentrations of various air pollutants to safe levels and ensure equitable access to clean air. Since the U.S. Clean Air Act Amendments of 1990, air quality in the United States has improved. In 2017, the Washington D.C. area saw the fewest number of days in which ozone exceeded the 2015 ozone standard in decades.[6] A September 2017 report from the Metropolitan Washington Council of Governments noted that the number of ozone exceedance days in the Washington D.C. area have decreased by 75 percent. In California, the total number of days in which ground-level ozone concentrations exceeded the 1997 8-hr ozone standard decreased to only 63 in 2016 down from 202 in 1979, a reduction of almost 70 percent.[7] While these are just a few examples of progress that has been made toward improving global air quality thus far, some areas across the globe have found the task of improving regional air quality more challenging.

A 2016 update from the WHO states that 80 percent of the population living in areas where ambient air concentrations of air pollutants are measured are exposed to levels which exceed safe levels as set by the WHO. Additionally, the WHO states: "98 percent of cities in low- and middle-income countries with more than 100,000 inhabitants do not meet WHO air quality guidelines. However, in high-income countries, that percentage decreases to 55 percent".[8]

This discrepancy is especially pronounced in India. A review of WHO data compiled in 2016 revealed that in 2012, there were 12 Indian cities reporting an annual ambient air concentration of $PM_{2.5}$ of 100 µg/m^3 or higher. In Delhi, the 2012 annual concentration for PM_{10} was 229 µg/m^3, more than 10 times higher than the WHO's guideline for PM_{10} of 20 µg/m^3. In Beijing, home to approximately 21 million people in 2013, the 2012 annual average ambient air concentration of $PM_{2.5}$ was 85 µg/m^3.[9] In some ways, the results are not surprising. Economic growth observed in high-income countries is closely linked to consumer spending habits. As demand increases for everyday items such as toys, cars, and textiles, the majority of the burden to produce these items falls on developing nations with less strict environmental policy and higher population densities.

Although air quality monitoring results in lower income nations do not necessarily indicate a marked improvement in air quality, further collaboration between policy-makers and the scientific community are likely to have a continued positive impact.

In the United States, this collaboration has been the primary cause for the improvements observed in air quality over the past few decades. U.S. Environmental Protection Agency (EPA) programs, such as the New Source Performance Standards (NSPS), New Source Review, and Maximum Achievable Control Technology standards, have all had a significant impact on improving air quality by lowering the ambient concentrations of NO_X, VOC, CO, SO_X, and PM. Some areas, such as southern California, have committed to working toward electrifying the transportation network, implementing more stringent standards on diesel fuel sulfur content, and encouraging heavier utilization of public transportation.

Tackling the challenge of improving regional air quality across the globe is a task that many nations have agreed is paramount to ensuring a reduction in frequency of air pollution-related disease and premature deaths. Although it is a daunting task, some of the globe's most polluted regions have begun to see an increase air quality over the past several decades. It is encouraging to see the progress that has been made thus far as a result of the scientific community and policy-makers working together and it is further encouraging to see additional progress made toward cleaner air and fewer incidences of air-pollution related disease and premature deaths. **em**

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