

Friday, 24th February 2023

3

The recent transboundary haze event received noticeable attention in Sri Lanka due to climatic changes and respiratory system-associated health problems, particularly in children and older adult. Same as in November 2019, Sri Lanka was exposed to this haze event again in December 2022, parallel to the haze event in India.

Air Quality Index (AQI) should be between 0 to 50 AQI in order for it to be considered a satisfactory level for breathing. According to news reports, India's Air Quality Index suddenly rose to a very unhealthy level (401-500 AQI) at the end of November 2022. The National Building Research Organization (NBRO) report stated that AQI was raised to unhealthy levels (peaking at above 200) from the 7th of December 2022 and persisted for a week, especially in Colombo, Gampaha, Kandy, and Jaffna districts. Due to a storm in the Bay of Bengal, the haze crossed international boundaries and came over to Sri Lanka, affecting the whole country. This was clearly visible as mist and fog in different parts of Sri Lanka during the event's peak days. The haze event in India was further aggravated because of the stubble and paddy burning.

Alteration of weather conditions, including humidity, wind speed, atmospheric temperature, and rainfall, also remarkably influenced the deposition of fine particulates and the bacterial consortia in the atmosphere. Even though physiochemical properties associated with haze events have been studied frequently, changes in microbial abundance are not monitored. Due to this polluted situation, the atmosphere becomes cold, and it can trigger the spread of microbial species such as bacteria, fungi and viruses. We, at the National Institute of Fundamental Studies (NIFS), conducted a study to determine the effect of this haze event on atmospheric bacteria compared to regular days. We conducted a similar study in November 2019, where

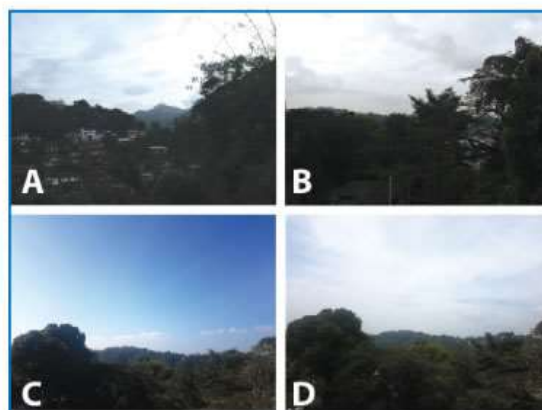
load during the haze.

Kandy is the main city of the central province of Sri Lanka, with a 773.7/km² population density. The air sampling (0.5m³ air per run) was conducted at NIFS premises at Hantana Hills (Figure 1) using Envirotech APM 550 Fine Particulate Air Sampler to elucidate the microbial diversity and load. Air samples were collected six consecutive days from 12th to 16th December 2022.

According to the data from laboratory analysis, the total microbial load during the hazy days was higher ($\sim 4.70 \times 10^6$ cells/m³ air) than the normal non-hazy days ($\sim 1.19 \times 10^6$ cells/m³ air). More than 20 different bacterial and fungal species were identified from the air samples collected over the six days during the haze event. In 2019 studies, only 12 culturable bacterial species were identified. It means the microbial diversity has increased this December 2022, compared to the November 2019 haze event period. Interestingly, the bacterial load and the diversity were remarkably high in the evening than in the mornings and noon. As shown in Figure 2, an increase in mist and fog during the haze events is evident compared to average days. According to the reported data on the world weather website, the wind speeds (Hazy days: ~ 3.4 -6.5 mph, Non-hazy days: ~ 0.5 -2 mph) were high in noon and evenings during the sampling days. It seems that the microbial load was high during the periods with high wind speed. According to analysis, the microbial diversity and the microbial load were low during the days when the atmospheric temperature was high. Research is in progress to identify the bacterial species, and as in the previous occasion, this time also, potential pathogenic bacterial species could be present. When we breathe, these disease-causing microbes that stick to dust particles can enter the human respiratory system, leading to respiratory infections and allergies. Therefore, it is vital to monitor these incidents, make the general public aware of the gravity of the situation, and educate them on the necessary precautions which should be taken.



Air quality in Kandy impacted by air pollution



Hazy day 2022.12.14 morning 11.00am(A) & evening

4.00pm(B) Photos taken at NIFS premises.

Non-Hazy day 2022.12.30 morning 11.00am(C) & evening

4.00pm(D) Photos taken from NIFS premises. (figure 02)

Reference:

- Thilakarathne, S. M. N. K., Ekanayake, A. Madamarandawala, P. S., Weeraratne, W. B. C. P., Thotawatthage, C. A., & Magana-Arachchi, D. N. (2021, January 7). *Impact of haze events on airborne bacterial consortia-A case study - SN Applied Sciences*. SpringerLink. Retrieved January 15, 2023, from <https://link.springer.com/article/10.1007/s42452-020-04022-0>

Weather in Kandy in December

2022 (Central Province) - detailed Weather Forecast for a month. (n.d.). World-Weather.info. https://world-weather.info/forecast/sri_lanka/kandy/december-2022/

Prof. D.N.Magana-Arachchi & Research Group