DECISION SUPPORT SYSTEM FOR AIR QUALITY MANAGEMENT IN DELHI, INDIA

This paper discusses the newly developed Decision Support System for air quality management activities in Delhi, India. Besides the standard air quality forecasts, DSS provides the contribution of Delhi, its surrounding districts, and stubble-burning fires mainly occurring in the neighbouring states of Punjab and Haryana to the PM2.5 in Delhi. DSS also quantifies the effects of local and neighbourhood emission-source-level interventions on the pollution in Delhi.

The DSS-simulated Air Quality Index (AQI) for the post-monsoon and winter seasons of 2021–2022 shows high accuracy (up to 80 %) and a very low false alarm ratio (20 %) from day 1 to day 5 of the forecasts, especially when the ambient AQI is > 300. During the post-monsoon season (winter season), emissions from Delhi, the rest of the National Capital Region (NCR)'s districts, biomass-burning activities, and all other remaining regions on average contribute 34.4 % (33.4 %), 31 % (40.2 %), 7.3 % (0.1 %), and 27.3 % (26.4 %), respectively, to the PM2.5 in Delhi. During peak pollution events (stubble-burning periods or wintertime), however, the contribution from the main sources (farm fires in Punjab–Haryana or local sources within Delhi) could reach 65 %–69 %.

According to DSS, a 20 % (40 %) reduction in anthropogenic emissions across all NCR districts would result in a 12 % (24 %) reduction in PM2.5 in Delhi on a seasonal mean basis. DSS is a critical tool for policymakers because it provides all such information daily through a single simulation.

Reference: Govardhan, G., Ghude, S.D., Kumar, R., Sharma, S., Gunwani, P., Jena, C., Yadav, P., Ingle, S.,Debnath, S., Pawar, P., Acharja, P., Jat, R., Kalita, G., Ambulkar, R., Kulkarni, S., Kaginalkar, A.,Soni, V.K., Nanjundiah, R.S., Rajeevan, M.(2024) Decision Support System version 1.0 (DSS v1.0) for air quality management in Delhi, India .In: Geoscientific Model Development, 17 (7), pp. 2617-2640.

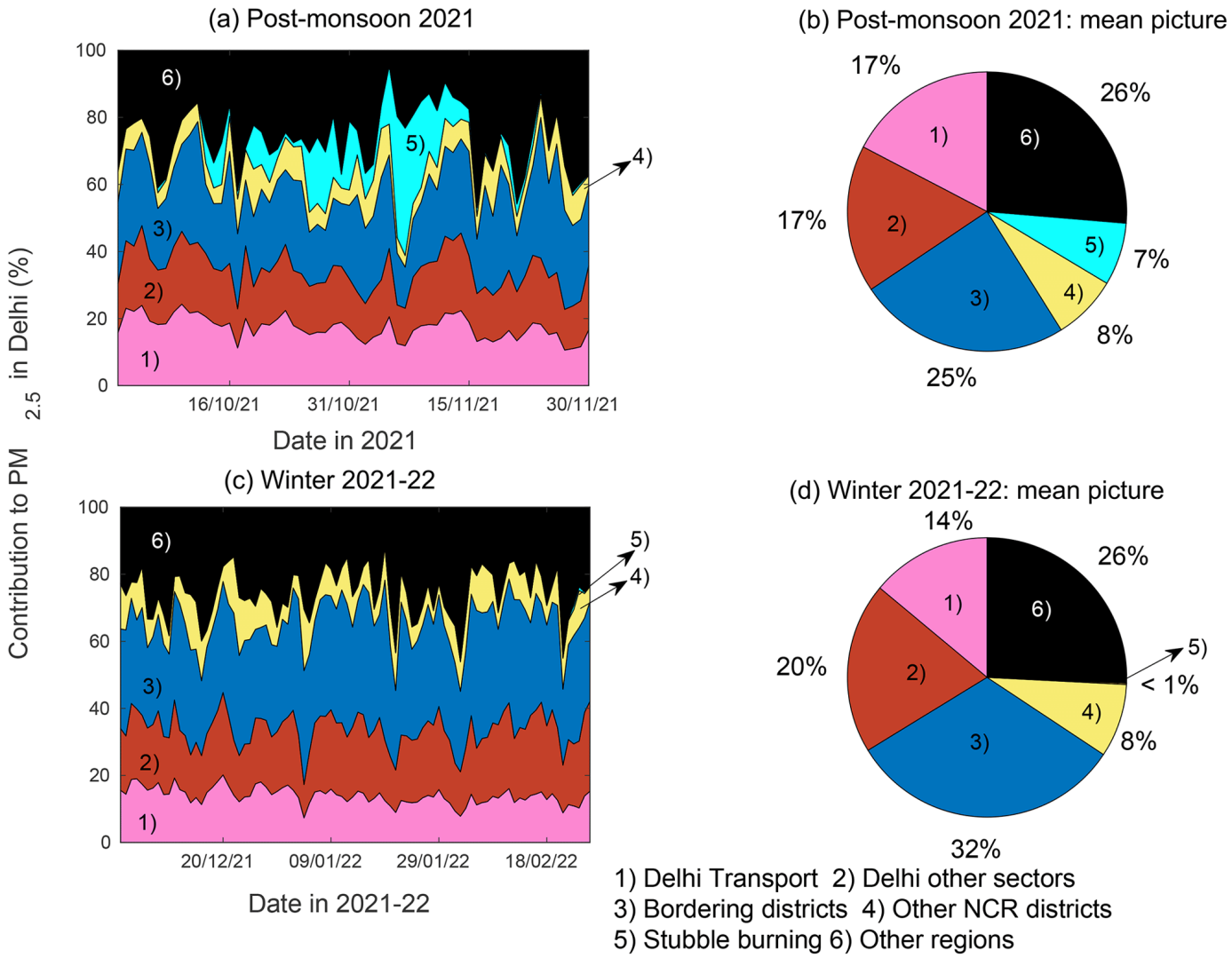

Figure: Source apportionment of PM2.5 mass concentration in Delhi for (a) post-monsoon 2021 on a daily mean basis, (b) post-monsoon 2021 on a seasonal mean basis, (c) winter 2021–2022 on a daily mean basis, and (d) winter 2022 on a seasonal mean basis. The numbers written on the pie charts indicate the percentage contribution of the particular source to PM2.5 in Delhi. Day 1 forecasts have been used to generate this figure.