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Reducing Ozone Pollution Can Prevent Early Deaths In Southeast Asia

Stricter air pollution controls in Southeast Asia could prevent up to 36,000 ozone-related premature deaths annually by 2050.

AsianScientist (Jun. 18, 2025) – Far above our heads, the ozone layer shields us from harmful UV rays. On the ground level however, ozone acts as a dangerous pollutant and greenhouse gas. Repeated ozone exposure can worsen respiratory and cardiovascular diseases, leading to premature death.

Ground-level ozone is formed when nitrogen oxides (NO_x) react with volatile organic compounds (VOCs) in sunlight. Ozone pollution is an escalating problem in Southeast Asia due to economic development, with NO_x and VOCs being emitted by vehicles, factories, and power plants. As a tropical region, Southeast Asia also has a high level of natural VOC emissions from plants.

Using advanced computer models, researchers from Nanyang Technological University (NTU), Singapore, and the Chinese University of Hong Kong drew on emissions and air quality data from international databases to project future ozone levels in Southeast Asia under different scenarios. They then conducted a health impact assessment for each scenario to determine how health outcomes might be affected by ozone levels.

Following current trajectories, annual ozone-related premature deaths in Southeast Asia could drop by 22,000 per year by 2050, thanks to planned NO_x emissions reductions from power plants, factories and transport.

The optimistic scenario with more stringent emissions controls could reduce yearly ozone-related premature deaths by 36,000 by 2050. These findings highlight the urgent need for stronger efforts to mitigate air pollution. The team suggests that implementing stricter regulations on industry, transport, and biomass burning could curb ozone formation.

“Ozone reduction is not straightforward, as it requires careful regulation of its precursors—nitrogen oxides and volatile organic compounds—rather than direct removal from the atmosphere. The tropical conditions in Southeast Asia also make ozone formation different from that in other parts of the world,” said associate professor Steve Yim of NTU Singapore, lead author of the study.

“Ozone is an invisible yet harmful pollutant. Our study shows that by taking decisive steps now, we can significantly reduce the region’s health burden and improve air quality. This research reinforces the vital role of air quality management in protecting public health,” said Joseph Sung, distinguished university professor, NTU Singapore, and co-author of the study. “The links between ozone exposure and respiratory illness are well-established, and our findings offer robust evidence to inform policy decisions that will protect the well-being of millions across Southeast Asia.”

The researchers also used their model to determine the most efficient way to reduce ozone formation in different areas.

In major urban areas like Singapore, Jakarta, and Kuala Lumpur, NO_x and VOCs both contribute to ozone formation, meaning both pollutants need to be managed to reduce ozone levels in cities. Meanwhile, in rural areas and coastal regions, NO_x contributes more strongly to ozone formation, and a targeted NO_x reduction would be more effective.

Next, the team is planning to investigate how climate change and land-use patterns could influence ozone pollution. They hope to collaborate with policymakers and environmental organisations to implement sustainable air quality management strategies

“We believe our research fills a critical knowledge gap by examining how ozone behaves specifically in Southeast Asia, a region that has received relatively little attention in this context,” said Yim.