Two-stroke scooters are 'super-polluters', study finds

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Scientists point the finger at two-stroke scooters, a ubiquitous sight in developing countries, for massively contributing to local air pollution, like these auto-rickshaws in Karachi, Pakistan

Scientists on Tuesday pointed the finger at two-stroke scooters, a ubiquitous sight in developing countries, for massively contributing to local air pollution.

Running on a mix of oil and petrol, the scooter spews out between tens and thousands of times more fine particles and toxic gases, proportionate to the amount of fuel consumed, than even heavy trucks and buses, they said.

In choked cities such as Bangkok, the vast fleet of these "super-polluters" may be the biggest single source of roadside emissions, the researchers said in a study published in the journal *Nature Communications*.

"Cars and trucks, particularly diesel vehicles, are thought to be the main vehicular pollution sources," they wrote.

"This needs re-thinking, as we show that elevated particulate matter levels can be a consequence of 'asymmetric pollution' from two-stroke scooters."

Andre Prevot, an atmospheric chemist at the Paul Scherrer Institute in Villigen, Switzerland, analysed exhaust emissions from two-stroke scooters authorised for use in Europe.

Emissions of volatile organic compounds (VOCs)—a bouquet of carbon gases that are precursors for smog—were on average 124 times higher from an idling two-stroke scooter than for a vehicle from another class.

Levels of benzene, a cancer-causing VOC, were astounding, Prevot's team found.

Scooter exhaust during idling had as much as 300,000 micrograms (mcg) of benzene per cubic metre, or 146 parts per million (ppm), the scientists found.

By comparison, the European Union (EU) sets a safety level for annual

exposure of five mcg/cu. m., while health watchdogs in the United States recommend that workers wear special breathing equipment when exposed to benzene levels exceeding 1ppm for 15 minutes.

"The (benzene) emissions are huge," Prevot said in an email exchange with AFP. "Thinking about being on a bike and breathing the emissions from an idling scooter in front at a traffic light is rather disturbing."

The paper calculated that in cities such as Bangkok, two-stroke scooters could contribute between 60 and 90 percent of all roadside primary particulate matter—carbon particles that result directly from fossil-fuel combustions—even though they account for only 10 percent of fuel consumption.

The scooters' overall impact may even be a conservative estimate, Prevot said.

Some scooters in use in Asia may be three times more polluting than in Europe, given their age, difference in use—for hauling heavy loads of humans or cargo—and unlicensed modification.

Autorickshaws tested in India yielded five times more emissions on average than the European scooter, he said.

The study noted the situation in China, where many cities have banned or restricted scooters since the late 1990s.

Roadside VOC levels in Dongguan, where scooters are allowed, are now higher than in Guangzhou, 60 kilometers (37 miles) away, where they are banned, even though traffic in the latter city is far higher.

"Restrictions on two-stroke scooters, already implemented in China, could improve air quality in many cities around the globe," the paper

said.

More information: "Two-stroke scooters are a dominant source of air pollution in many cities." S.M. Platt, et al. *Nature Communications* 5, Article number: 3749 doi:10.1038/ncomms4749. Received 12 October 2013 Accepted 28 March 2014 Published 13 May 2014