

## **Clean fuel worsens climate impacts for some vehicle engines: study**

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Auto-rickshaw being tested for emissions in an Indian lab.

A pioneering program by one of the world's largest cities to switch its vehicle fleet to clean fuel has not significantly improved harmful vehicle emissions in more than 5,000 vehicles – and worsened some vehicles' climate impacts – a new University of British Columbia study finds.

The study – which explores the impacts of New Delhi, India's 2003 conversion of 90,000 buses, taxis and auto-rickshaws to compressed natural gas (CNG), a well-known "clean" fuel – provides crucial information for other cities considering similar projects.

Of the city's more than 5,000 auto-rickshaws with two-stroke engines – a common form of transportation in Asia and Africa – the study found



that CNG produced only minor reductions in emissions that cause air pollution and an increase in emissions that negatively impact climate change.

According to the researchers, the New Delhi's program could have achieved greater emission reductions at a cheaper price by simply upgrading two-stroke models to the cleaner, more fuel-efficient fourstroke variety.

"Our study demonstrates the importance of engine type when adopting clean fuels," says lead author and UBC post-doctoral fellow Conor Reynolds. "Despite switching to CNG, two-stroke <u>engine</u> auto-rickshaws in Delhi still produce similar levels of particulate matter per kilogram of fuel to a diesel bus – and their climate impacts are worse than before."

Published online in the journal *Environmental Science and Technology*, the study is the first to comprehensively examine the pollutant emissions from small vehicle engines fuelled with CNG. It included significant laboratory testing of Indian auto-rickshaws.

The study finds that as much as one third of CNG is not properly burned in two-stroke engines, producing high emissions of methane, a major greenhouse gas that contributes to climate change. CNG use also produced substantial emissions of high particulate matter from unburned lubricating oil, which can appear as blue smoke.

The findings show the importance of strong scientific data for policymakers and the need to consider small vehicles like auto-rickshaws in emissions reduction programs, according to the researchers.

"If policymakers have information about emissions and their potential impacts, they can make better decisions to serve both the public and the environment," says Reynolds, who co-authored the study with Prof.



Milind Kandlikar and post-doctoral fellow Andrew Grieshop from UBC's Liu Institute for Global Issues and Institute for Resources, Environment and Sustainability.

According to the researchers, the study has broad implications for the design of public health interventions.

"Clean fuels are being used in Indian cities for transportation when they could save many more lives if used for cooking," says Kandlikar. "The interests of the rural poor, particularly women and children, are being put below those of the urban consumer."

According to the researchers, several Asian cities have more two-stroke auto-rickshaws than New Delhi. They say the study provides important information to other cities considering fuel-switching programs, especially those in rapidly industrializing cities in India, Pakistan, Bangladesh, Philippines, Thailand, and Indonesia, where major autorickshaw fleets exist.

**More information:** View the study at: pubs.acs.org/doi/abs/10.1021/es102430p

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