

Impacts of tampering on the emissions inventory from heavy-duty vehicles in Canada

BACKGROUND

Emission control tampering in heavy-duty vehicles can have serious consequences for public health, warranting proactive regulatory action to eliminate such practices. A new ICCT study provides a holistic assessment of the issues that motivate and facilitate tampering with the emission control systems of heavy-duty vehicles in Canada. Insights into these issues are gained from a legislative perspective, an analysis of the technology vulnerabilities of modern heavy-duty vehicles, an assessment of the market for tampering devices and services, the views of fleet operators, and an analysis of the excess emissions caused by tampering and the associated health impacts.

FINDINGS

- » **Anti-tampering legislation in Canada is insufficient.** Regulatory provisions prohibiting tampering and enabling its detection are decentralized. While many provincial statutes explicitly prohibit the tampering of emission control systems, only a few provinces have adopted provisions that enable the enforcement of such tampering prohibitions.
- » **Tampering devices and services are readily available from well-established providers.** Several key components of emission control systems are vulnerable to tampering through both hardware and software modifications. The evaluation reveals that a combination of hardware removal and reflashing of the control units is one of the more popular approaches in the North American market.
- » **Tampering leads to substantial increases in pollutant emissions.** We project that each percentage increase in the tampering incidence will result in a 15% increase in emissions of particulate matter (PM) and a 57% increase in nitrogen oxides (NO_x) emissions in 2040. Tampering has increasingly hindered potential reductions in emissions.



Tailpipe NO_x and PM emissions from medium- and heavy-duty vehicles by province in 2020, 2030, and 2040 (kilotonnes). Dark segments show baseline emissions under a scenario without tampering. Light segments indicate the percent increase in emissions associated with a 1% increase in the number of tampered vehicles on the road.

» **The increase in emissions caused by tampering leads to severe health impacts.**

Soot and NO_x emissions from diesel engines are primary causes of ambient air pollution of PM_{2.5} and ozone, both of which have been shown to result in significant health impacts. We estimate that a 1% increase in the incidence of tampering will lead to 690 excess premature deaths over the next 20 years. The health burden will be disproportionately felt by elderly people from ages 70 to 90 years old, with the main causes being heart disease, chronic obstructive pulmonary disease, and cancer. It is also expected that the health impact will be disproportionately borne by disadvantaged communities living near high traffic freight corridors.

RECOMMENDATIONS

- » **Canada should explicitly prohibit tampering at the federal level.** While several Canadian provinces and territories have made it illegal to tamper with emission control systems, the prohibition does not apply across all of Canada. Four provinces do not prohibit tampering, the most notable example being Alberta, Canada's fourth most populous province.
- » **Steep penalties should be set for the providers and users of tampering devices and services.** Adequate penalties for tampering, and for those offering such services or products, can be a strong deterrent. Canada can seek to set penalties aligned with those of the United States.
- » **Inspection and maintenance programs must be redesigned to address tampering.** A successful inspection and maintenance program requires a comprehensive institutional infrastructure and a technical design coherent with modern emission control systems. As a first step, smoke opacimeters can be substituted by particulate number counting instruments which are able to detect particulate filter removal, tampering, or other DPF malfunctions.
- » **Remote sensing and roadside emission inspection should be used in tandem as a market surveillance tool against tampering.** A combination of remote sensing measurement and roadside inspection is a successful market surveillance approach to detect and deter tampering. An effective roadside inspection program would enable inspectors or law enforcement to pull over suspicious vehicles for tampering inspection.
- » **Future pollutant emission standards should drive the adoption of anti-tampering technologies.** Several technologies can be used to harden emission control systems against tampering. Anti-tampering regulations can set clear requirements for manufacturers to deploy such technologies.

PUBLICATION DETAILS

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