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PETROL engines may not be as harmful to the planet as their more efficient diesel counterparts. A comprehensive climate model shows that the soot produced by diesel engines will warm the climate more over the next century than the extra carbon dioxide emitted by petrol-powered vehicles.

That will come as a shock to those who believe that a diesel engine's better mileage and lower CO₂ emissions make it easier on the climate. "Tax laws in all of Europe except the UK favour diesel — and that inadvertently promotes global warming," says the model's creator Mark Jacobson, an environmental engineer at Stanford University in California.

Diesel engines spew out relatively more particles of soot, which can cause respiratory problems. But the mileage of a diesel car is on average 35 per cent better than a petrol-powered car, green credentials that have encouraged governments to tax the fuel at a lower rate. Per kilometre, diesel also produces about 6 per cent less CO₂.

But until now it has proved all but impossible to judge the true impact on the climate of soot from diesel engines. Black particles of carbon can absorb sunlight, warming the air but shielding the ground below and allowing it to cool. Soot particles also affect the humidity of the air, acting as seeds around which water droplets form, and can even influence how other pollutants accumulate in the air and change weather patterns. All these factors affect whether soot particles help to reflect or absorb sunlight.

Jacobson's model takes all these factors into account, and it shows that, overall, 1 gram of black carbon is 360,000 to 840,000 times as powerful a global warming agent as 1 gram of CO₂.

So while diesel engines emit less CO₂ than petrol engines, the fact that they spew out 25 to 400 times as much soot makes them much more potent warmers (Journal of Geophysical Research DOI: 10.1029/2001JD001376). Biodiesel fuel made from recycled cooking fat or ground-up plant matter produces 30 per cent less particulate matter than regular diesel and emits about half the amount of CO₂ over its lifetime. But even it would still have greater warming potential than petrol over the first few years of use.

In the long term, however, the picture changes completely. Soot only stays in the air for weeks to months, while CO₂ will linger for 50 to 200 years. So while petrol engines will create less global warming over the next 100 years, the cumulative effects mean they will cause more global warming 150 years from now, says Jacobson.

But he points out that cleaner technologies should be available by then, such as hydrogen fuel cells that emit only water, for example. Until then, petrol, rather than diesel, is the lesser evil.

Surabi Menon, a climate researcher with NASA and Columbia University in New York, is impressed by the detail of Jacobson's model. But she says the same kind of study needs to be done with all the aerosols and gases produced by engines, rather than just soot and CO₂, before drawing a firm conclusion.

Still, she says, soot's impact on health is reason enough to want to reduce emissions from diesel engines. "The bottom line is you have to deal with both. You definitely can't ignore carbon dioxide," Jacobson says. "But controlling soot could be the most effective way to slow global warming."

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