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## SUSTAINABLE FUTURES

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### [Larger hybrid vehicles lose fuel consumption advantage](#)

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A North American trend for hybrid-electric vehicles that are heavier and more powerful is eroding the fuel consumption advantages of hybrid technology. That's according to researchers from the University of British Columbia in Canada, who conducted the first study of fuel consumption of a range of production hybrid vehicles.

"The types of hybrids that are in production have changed significantly," researchers Milind Kandlikar and Conor Reynolds told *environmentalresearchweb*. "In early 2000, consumers had the choice of only two compact cars, the Toyota Prius and the Honda Insight. Now there are three hybrid SUVs [sport utility vehicles]: the Ford Escape hybrid, Toyota Highlander hybrid and Lexus RX 400h; and two high-performance hybrid cars: the Honda Accord hybrid and Lexus GS 450h."

Hybrid-electric vehicles combine a conventional internal combustion engine alongside an electric motor and features such as regenerative braking, batteries and reduction of engine idling time to cut fuel consumption.

The technology made up about 1.6% of new vehicle sales in the US in 2006, and take-up is projected to increase. In the same year, around 30% of total US hybrid sales were sport utility vehicles.

Between 2000 and 2006, the average curb weight of hybrid-electric vehicles (weighted by sales volume) increased by 30%. Similarly, the hybrid-electric systems now deliver 60% more power.

Kandlikar and Reynolds say that heavier and more powerful hybrid vehicles are substantially eating into the gains of hybrid technology. "Governments have offered quite substantial tax incentives to individuals to purchase these vehicles," they said. "Incentives need to be tied to actual environmental benefits. For example, hybrids of all sizes and performance are given a federal tax credit - a more targeted approach may be more fruitful."

The researchers found that a hybrid vehicle will use on average 2.7 l of fuel less per 100 km than a conventional vehicle of the same weight and power. For a driving distance of 20,000 km a year this reduces fuel use by about 530 l. "Obviously this translates to quite a bit less carbon dioxide emitted," said the team.

However, a hybrid vehicle 100 kg heavier than an otherwise identical conventional vehicle would have a fuel consumption 0.15 l more per 100 km. And an increase of 10 kW in the hybrid's power would give a fuel consumption penalty of 0.27 l per 100 km.

That said, increasing the weight of a hybrid vehicle has less of an effect on fuel consumption than making a heavier conventional vehicle. "In other words, hybrid technology is less influenced by the trend towards larger, heavier vehicles than conventional engine technology," said Reynolds. According to the researchers, this is mostly because of the way that hybrid-electric systems recapture energy during vehicle braking.

The team found that a 100 kg change in vehicle weight increased fuel consumption by 0.7 l per 100 km in internal combustion engine vehicles but only by 0.4 l per 100 km in hybrid-electric vehicles.

The University of British Columbia research group is also working on other environmental lifecycle implications of hybrids, including local air pollution and heavy metal extraction for manufacture of hybrid car batteries. "We plan to provide a comprehensive picture of the environmental benefits - or impacts - of this technology," said Reynolds.

The researchers reported their work in *Environmental Research Letters*.

#### About the author

Liz Kalaugher is editor of *environmentalresearchweb*.

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