National Center for Sustainable Transportation

POLICY BRIEF

Reducing the Carbon Footprint of Heavy-Duty Trucks through Eco-Driving

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Issue

A typical commercial truck in the United States consumes over 20,000 gallons of fuel each year, producing a large amount of greenhouse gas (GHG) emissions in the process (Figure 1). A significant portion

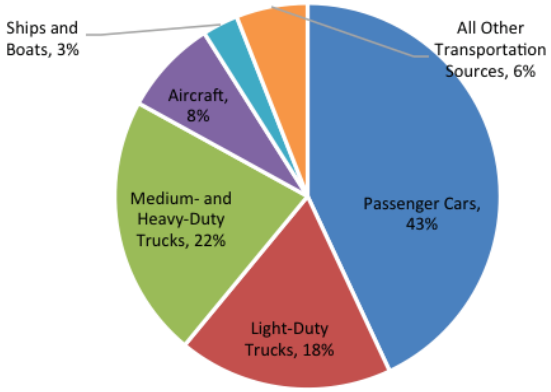

Figure 1: U.S. greenhouse gas emissions 1990-2011 by transportation source

of fuel consumed by trucks is wasted due to inefficient vehicle operation (Figure 2). One low-hanging strategy that can improve fuel efficiency and reduce GHG emissions from trucking operations is

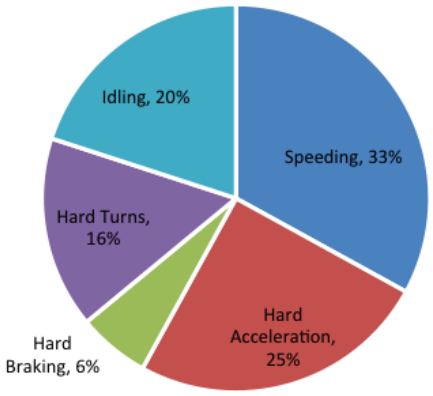

Figure 2: Reasons for fuel waste of typical freight truck

eco-driving. A truck eco-driving program encourages or incentivizes truck drivers to embrace fuel-efficient vehicle operation and maintenance practices. Examples of eco-driving practices include avoiding hilly route and heavy traffic, using moderate highway speed, minimizing hard acceleration and braking, and keeping the tires properly inflated. Evidence from Europe, Asia, and North America suggest that truck eco-driving programs can improve fuel efficiency, and in turn reduce GHG emissions, by 5% to 15%. Truck operators and fleet managers stand to benefit from implementing an eco-driving program given than fuel cost is the largest expense of commercial trucking operations, accounting for more than a third of total operating costs.

Policy Implications

A wide range of policies can be implemented to support truck eco-driving programs. For example, eco-driving awareness campaigns may be conducted by governmental agencies at any level (federal, state, regional, or local). Eco-driving education and training may be incorporated as part of the commercial driver's licensing process. Free access to air pumps for tire inflation may be made available at truck stops and rest areas. Financial subsidies may be provided for the purchase of technologies that facilitate eco-driving practices. Truck manufacturers may be encouraged or mandated to include eco-driving technologies such as in-vehicle driver feedback instrumentation in new model year trucks. For truck fleets, an internal policy can be established to recognize or reward truck drivers for embracing eco-driving practices and improving their fuel efficiency performance. For example, a study of 46 U.S. truck drivers found that providing financial incentives on top of individualized coaching and using an in-vehicle real-time

feedback system approximately doubled the fuel economy improvements.

In addition, government agencies can invest in additional research on truck eco-driving. Example research topics include quantification of air quality and safety co-benefits of truck eco-driving, investigation of potential impact of large-scale adoption on traffic flow, and further advancement of truck eco-driving technologies.

Research Findings

Truck eco-driving programs generally consist of three main elements:

1. ***driver education and training***, which can be delivered online, in a classroom setting, on-road through one-on-one coaching, or with a driving simulator (Figure 3);
2. ***vehicle maintenance and technology support*** (e.g., the use of a speed limiter to ensure no speeding, utilizing an auxiliary power unit to heat or cool the truck cab instead of idling the engine, and installing an in-vehicle driver feedback instrument that provides real-time fuel efficiency information to the driver); and
3. ***policy support*** as described in the above section.

Figure 3: Truck eco-driving training in driving simulator. [Photo: https://www.iru.org/en_policy_co2_response_ecodriving]

A number of truck eco-driving evaluation studies have been conducted in Europe, Asia, Australia, and North America. For truck eco-driving evaluation studies that involve a large number of drivers, on the order of hundreds or thousands, the reported improvements in fuel economy are in the range of 5% to 15%. Variation among studies is due to several factors including the method of delivering eco-driving training (e.g., class versus individualized coaching), the setting for evaluating fuel economy improvement (e.g., closed driving course versus actual real-world route), the number of truck driver samples, and their baseline driving performance prior to receiving eco-driving training, among others.

There has been evidence that the fuel savings benefit of eco-driving could fade over time as drivers revert back to the old habits of driving. Fortunately, many truck fleets have started to deploy telematics systems that monitor location, speed, acceleration, gear shifting, fuel consumption, etc. of their trucks in real time. As more trucking companies adopt these systems, it is expected that more information will become available on the effectiveness of truck eco-driving programs in general as well as best practices for ensuring long-term eco-driving behavior in order to maintain fuel savings benefit.

Many of the barriers facing the implementation of eco-driving programs are institutional. For example, incorporating eco-driving training or an exam as part of a commercial driver's licensing process would involve substantial institutional change by government agencies. As another example, encouraging or mandating inclusion of fuel saving technologies such as in-vehicle fuel efficiency feedback instrumentation in the new model year trucks would require working closely with truck manufacturers and other stakeholders. And if successful, it would still take many years for the existing truck fleet to turn over before the trucks with eco-driving technologies become predominant in the fleet. Lastly, funding is needed in order to carry out educational eco-driving campaigns or to provide financial subsidies for the retrofit of existing trucks with eco-driving technologies. The lack of funding to support these programs is, thus, another potential barrier.

Further Reading

This policy brief is drawn from the full report, "Reducing Carbon Footprint of Freight Movement through Eco-Driving Programs for Heavy-Duty Trucks" by Kanok Boriboonsomsin. The white paper can be downloaded at: http://bit.ly/1QQCnqs

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