

Danger ahead

**Why weight-based CO2 standards will make
Europe's car fleet dirtier and less safe**

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Background

In February 2007 the European Commission published a review of the EU strategy on reducing carbon dioxide emissions (CO₂) from new cars. That review announced future regulation, for the first time.

Both the European Parliament and national environment ministers will have their say on the proposed strategy in advance of legislation expected to be presented by the Commission by the end of 2007. A legal proposal would then need to be approved, again by the Parliament and national environment ministers before becoming law, a process that typically takes 1-2 years.

In the months since the review was published there have been several media reports suggesting that the new legislation could feature a range of standards for different types of car.

The car industry is actively lobbying to make CO₂ standards dependent on the *weight* of the car. In other words the industry argues that heavy cars should be subject to weaker CO₂ standards than light ones¹.

Summary

In this short briefing, T&E explains that using vehicle **weight** as the attribute to base car CO₂ standards on has serious negative consequences for safety, emissions and costs. Weight-based CO₂ standards in America have led to weight increases of 13 to 28 per cent. And contrary to the conventional wisdom, Japanese weight-based fuel economy standards failed to break the trend towards heavier vehicles.

Furthermore, T&E argues that the car's '**footprint**' (track width multiplied by wheelbase), as used in the definition of new American light truck fuel economy standards, is the best available alternative car attribute.

The best solution overall, however, is to apply the same CO₂ standard to all cars.

Introduction

T&E fundamentally believes Europe should continue to have a fleet average CO₂ standard for all cars sold in a given year. And that there should be no distinction between classes of car. Such an approach:

1. ensures that fleet average efficiency standards are met (as long as they are mandatory)
2. promotes both low-carbon car *technologies* and low-carbon car *specifications* (e.g. smaller engines) to the fullest extent.
3. fully rewards car makers that chose to honour the existing voluntary commitment, set in 1998/9 to reach 140g CO₂/km fleet average by 2008/9. Several carmakers are on track to reach that standard, but the majority are set to fail². The latter group should not be rewarded for failing to live up to their own commitment.

¹ "Europe's cars may get weight-based emissions allowances" (EUObserver 07/08/07 <http://euobserver.com/?aid=24574>); "Verheugen adds fuel to car CO₂ debate" (ENDS Europe Daily, 13/08/07 <http://www.endseuropedaily.com/articles/index.cfm?action=article&ref=23721&searchtext=weight&searchtype=A1>); "Auch kleine Autos müssen sauberer werden!" (Bild am Sonntag, <http://www.bild.t-online.de/BTO/news/2007/08/12/verheugen-quenter/autos-klima.geo=2299902.html>); "Audi CEO Stadler backs weight-based CO₂ system" (Automotive News Europe, 13/08/07 <http://www.autonews.com/apps/pbcs.dll/article?AID=/20070813/ANE01/70813003/1116/EUROPE&refsect=EUROPE>), "Proposed CO₂ scheme would help Germans" (Automotive News Europe, 20/08/07 <http://www.autonews.com/apps/pbcs.dll/article?AID=/20070820/ANE/70817027&SearchID=73291017426277>)

² See "How Clean is Your Car Brand?", T&E, 2006 <http://www.transportenvironment.org/Article250.html>

If the car CO2 standard were to temporarily differ depending on the class of car, the standard should be based on an objective car attribute. It should not be based on, for example, fleet average performances of companies. Giving every manufacturer a specific annual improvement standard would be unfair as it penalises those carmakers that have already made reductions above and beyond those of other carmakers – so-called 'first movers'.

This begs the question, on the basis of which objective car attribute should a car get a different CO2 standard ?

The attribute should fulfil four criteria:

1. it should not compromise the safety of other road users or car passengers
2. it should keep as many paths to reducing CO2 emissions of cars open (i.e. it should not reward car makers for adding features that use more fuel)
3. it should not invite 'cheating' by carmakers or 'tampering' in the after-sales market (for example by encouraging 'chip tuning')
4. it should be a fair representation of consumer utility.

How far 'weight' and 'footprint' as class attributes fulfill the above criteria is discussed in the next section.

Analysis of 'weight' and 'footprint' as class attributes

1. Safety

It is obvious, though important, that policies designed to cut CO2 emissions from cars should not compromise vehicle safety.

Weight-based CO2 standards would do just that as they remove the incentive to car makers to reduce vehicle weight: lighter cars would get a tougher CO2 standard. There is compelling evidence that heavier cars lead to more fatalities. Cars with a larger footprint do not. Studies have consistently shown up to four times higher levels of severe injury and death for pedestrians in collisions with SUVs³. SUVs distinguish themselves from normal cars primarily through their additional weight and height – not their footprint.

A report by Dynamic Research Inc. (DRI), which formed an important basis for US regulation (see below), showed that, if larger vehicles are safer for their occupants, it is not their *weight* but their size, more specifically their footprint, that makes them safer⁴. The summary of this report even states that "*weight reduction would be expected to decrease the overall number of fatalities*" – in other words: heavier cars are more dangerous. So CO2 standards that are easier on heavier cars can be expected to lead to more fatalities than CO2 standards that are easier for cars with a larger footprint.

It was primarily these safety concerns that persuaded the US government to base new (March 2006) fuel economy standards for light trucks on footprint. The National Highway Traffic Safety Administration (NHTSA), the responsible authority, argued extensively for this choice in its final decision:

³ Henry BY, Crandall J, Bhalla K, Mock CN, Roudsari BS. Child and adult pedestrian impact: the influence of vehicle type on injury severity. *Ann Proc Assoc Adv Automot Med* 2003;47:105-26; Roudsari BS, Mock CN, Kaufman R, Grossman D, Henry BY, Crandall J. Pedestrian crashes: higher injury severity and mortality rate for light truck vehicles compared with passenger vehicles. *Inj Prev* 2004;10:154-8; Ballesteros MF, Dischinger PC, Langenberg P. Pedestrian injuries and vehicle type in Maryland, 1995-1999. *Accid Anal Prev* 2004;36:73-81.

⁴ Dynamic Research, Inc., *A review of the results in the 1997 Kahane, 2002 DRI, 2003 DRI, and 2003 Kahane reports of the effects of passenger and light truck weight and size on fatality risk*, DRI-TR-04-02, R. M. Van Auken, J. W. Zellner, Torrance, March 2004. http://www.theicct.org/documents/DynamicResearch_WeightFatalityES_2004.pdf

“We also believe that use of the vehicle footprint attribute helps us achieve greater fuel economy without having a potential negative impact on safety. (...) Developing (...) standards based on vehicle footprint encourages compliance strategies that decrease rollover risk. (...) Overall, use of vehicle footprint is “weight-neutral” and thus does not exacerbate the vehicle compatibility problem.”

Revised Cafe standards for new cars are currently going through the legislative process in the US, but are widely expected to also be based on footprint, for the same reasons.

Conclusion: Weight-based CO2 standards will compromise safety. Footprint-based CO2 standards will not.

2. Keeping as many paths open to CO2 reduction as possible

Weight strongly influences the amount of fuel needed for acceleration, rolling resistance, and uphill driving. As Guenter Verheugen, Vice President of the European Commission has said: “It’s a law of nature that the more weight I move, the more energy I need”⁵. But ironically, defining CO2 standards by vehicle weight would eliminate weight reduction as a method of generating efficiency improvements, as car makers would not be rewarded for making cars lighter. Lighter cars would be ‘punished’ with a tougher CO2 target.

For European policy on clean cars to be successful, the full potential of car weight reduction technologies including lighter materials and smarter designs must be exploited. If not, the regulation will be more costly, less effective, or both.

Footprint, on the other hand, only affects the reduction of vehicle wheelbase and vehicle track width as a compliance strategy. Vehicle wheelbase does not influence CO2 emissions. Vehicle width is only one of three components determining air resistance, the others being vehicle height and the aerodynamic quality of the vehicle. Footprint-based CO2 standards therefore leave almost all paths to CO2 reduction open, many more than vehicle weight.

Conclusion: Weight-based CO2 standards eliminate one of the most important paths to CO2 reduction, footprint-based standards do not.

3. An attribute relevant to consumers ?

Weight is largely irrelevant to new-car buyers. Consumers do not choose cars based on their weight because a car being simply heavier or lighter offers no advantage in itself.

But vehicle footprint is defined as wheelbase multiplied by track width. It is therefore a good proxy for the interior space a car offers to its occupants.

If a consumer is looking for a larger vehicle, they do not want a heavy car, they want a more roomy car. Weight based standards will give them heavier and less roomy cars than footprint-based standards.

Conclusion: footprint is a relevant attribute for consumers, weight is not

⁵ “Auch kleine Autos müssen sauberer werden!” (Bild am Sonntag, http://www.bild.t-online.de/BTO/news/2007/08/12/verheugen-guenter/autos-klima_geo=2299902.html)

The failure of weight-based standards in Japan

Many make the claim that Japanese weight-based standards have not resulted in a heavier Japanese fleet⁶. This claim is wrong.

Market analysis shows that since the so-called 'Top Runner' system was introduced in Japan in 1998, weight has increased in both the 'kei'⁷ (very small) car segment (approx. 2% p.a.) and the standard car (approx. 0.5% p.a.) segment⁸. The market share of kei cars has grown dramatically in these eight years, from 23% to 34%, and is still growing⁹. The main reason for this is that kei cars do not require the owner to possess a parking space, an increasingly scarce resource. But there are other reasons for this growth, such as exemptions from other regulations and a favourable tax regime.

Had the market share of both types of cars not changed, then average weight would have increased by over 6% over the 8 years. This is broadly comparable to developments in Europe over that time, certainly if we take into account that a significant part of the weight increase in Europe is attributable to the increasing share of (heavier) diesel cars, a development that has not taken place in Japan. Japan has stuck to petrol. For additional comparison, between 1995 and 2005, the average weight of petrol cars in Europe increased 7.2% while standard (petrol) cars in Japan increased by 8.4%.

In addition, it should be noted that the Japanese car tax system strongly discourages ownership of heavy vehicles. For example, the Japan Automobile Manufacturers Association estimates that the owner of a subcompact car (750 kg curb weight) will pay \$4,000 less in taxes relative to a heavier passenger car (1,100 kg curb weight) over the lifetime of the vehicle¹⁰ (ICCT 2007).

The overall conclusion is, contrary to the myth, that the Japanese weight-based fuel economy standards failed to break the trend towards heavier vehicles. The apparent stabilisation of vehicle weight in Japan is misleading. When the strong increase in market share of (very small) 'kei' cars in Japan and (heavy) diesel cars in Europe is accounted for, Japanese and European developments in vehicle weight are broadly comparable.

The failure of weight-based standards in the United States

In 1975 the United States established the corporate average fuel economy (Cafe) program, which requires automobile manufacturers to meet a standard for the sales-weighted fuel economy of light duty passenger vehicles sold in the US.

The Cafe program maintains an important distinction between passenger cars on the one hand and so-called 'light trucks' on the other. Cars have a Cafe standard of 27.5 miles per gallon, (roughly 8.6 litres per 100 km). 'Light trucks' are either off-roaders (SUVs) or vehicles from 2,722 to 3,856 kg. They have a more relaxed standard of roughly 10.5 litres per 100 km. Vehicles over 3,856 kg, such as the Hummer or the Ford Explorer, are entirely exempt from CAFE – they are too heavy and hence classified as heavy duty vehicles.

⁶ For example the VDA (German car manufacturers association) 'Eine Tendenz zur Steigerung des Fahrzeuggewichts wie sie immer wieder unterstellt wird, ist namentlich in Japan nicht nachweisbar', submission to the consultation of the European Commission http://www.vda.de/de/co2_klimaschutz/stellungnahme/files/internet_konsultation.pdf

⁷ 'kei' cars: very small cars, max. length 3,4m., max. width 1.48m., max. cylinder capacity 0.66 l.

⁸ Japanese Automobile Manufacturers Association (JAMA) http://www.jama-english.jp/europe/news/2007/no_3/presentations.html, click to presentation "Verification concerning ICCT conversion of the Japanese fuel efficiency value to its CO2 equivalent in Europe (ICCT Comment by JAMA)".

⁹ http://www.jama-english.jp/publications/motor_vehicle_statistic2007.pdf

¹⁰ Japanese Automobile Manufacturers Association (JAMA). 2007. *Taxes and Automobiles (Japanese)* http://www.jama.or.jp/tax/tax_system/tax_system_3t1.html (Japanese)

The distinction between cars and light trucks was originally included in the CAFE legislation at a time when light trucks were a small percentage of the vehicle fleet, with the most common light trucks being pickups, used primarily for business and agricultural purposes. The distinctions in CAFE have however contributed to the widespread introduction of "cross-over" vehicles that combine features of both cars and light trucks and are generally used for personal transport¹¹. CAFE essentially rewards manufacturers for such moves through its more relaxed standards for heavier vehicles and SUVs.

The result has been a 28% increase in weight between 1987 and 2007, from 1,450 to 1,850 kg. This was mainly due to an increase in the share of light trucks from 28 to 49%. These developments were obviously not beneficial for fuel efficiency, which declined by 8 per cent over the period¹².

In short, the fact that US fuel efficiency regulations have been weight based has been one of the major reasons why the system has failed to achieve its objectives over time.

Conclusion

Weight-based CO₂ standards for cars are a very bad idea for the following reasons:

- they punish positive action. Car makers who reduce their vehicles' weight (one of the most important paths to cutting CO₂ emissions) would be faced with a stricter CO₂ standard. Therefore, they do not help to break the trend towards ever-heavier vehicles, which is one of the major reasons why car CO₂ emissions have not come down quickly enough in recent years;
- practical evidence confirms this: they have failed to stop the trend towards heavier cars in Japan, and have seriously aggravated such a trend in the US;
- this in turn leads to higher CO₂ emissions, higher CO₂ compliance costs, or both;
- it does not help vehicle safety – on the contrary, it will exacerbate vehicle compatibility problems, rollover risks, and risks for vulnerable road users;
- Vehicle weight is of little relevance to consumers, and not a driver of sales.

All these considerations apply regardless of how strongly CO₂ standards depend on weight. The more CO₂ standards depend on weight, the stronger the effects.

For all these reasons, the US has changed its policy. In 2006 they decided to base fuel economy standard for light trucks on their 'footprint' (wheel base times track width, a proxy for interior space of a car). Future CAFE standards for cars are also very likely to be based on footprint.

The footprint parameter does not have the drawbacks of weight and is therefore strongly preferable. The standard can easily be defined in such a way that extremely small cars such as the 'Smart' are not unduly penalised.

The best solution, however, would be not to differentiate car CO₂ standards at all. This sends the clearest signal to the industry and keeps all compliance options open.

¹¹ An and Sauer, Comparison of passenger vehicle fuel economy and greenhouse gas emission standards around the world, prepared for the Pew Center on Global Climate Change, December 2004

¹² US Environmental Protection Agency, Light-Duty Automotive Technology and Fuel Economy Trends: 1975 through 2007, Executive Summary, Washington, September 2007

For further information:

A number of other car attributes including engine power, interior volume, surface area and number of seats are explored in T&E's comprehensive position paper on car CO2 legislation. That paper also describes the way different classes should be defined if a class-based system is chosen.

www.transportenvironment.org/Article454.html