

Context

In 2009, the EU set legally-binding targets for new cars to emit 130 grams of CO₂ per kilometer (g/km) by 2015 and 95g/km in 2020.ⁱ In July, the Commission announced the outcome of its review of the modalities (ways) of achieving the 2020 target.ⁱⁱ

The regulation takes account of the “utility” or purpose of the cars produced by different manufacturers whose targets therefore vary. In 2009, the EU agreed to account for the utility of the vehicles and set targets for individual manufacturers by comparing the average weight (mass) of the cars they produce. This was largely because data was not available on the average size (footprint) of registered cars until 2011. The Commission’s new proposal is to continue to use mass as a measure of utility until 2020 in order to minimize changes to the regulation.

Using the weight of cars rather than footprint as a measure of utility has a number of important limitations. Notably, it discourages lightweighting of vehicles, making it more expensive to achieve the targets. This briefing explains the benefits of shifting to a footprint measure. The briefing also outlines the option of providing manufacturers with a choice of using either a mass or footprint based metric from 2015 to 2020, before switching to a footprint system for post-2020 regulations.

What is the footprint of a car?

The footprint of a car is the product of the average track width and wheelbase. The footprint is approximately the area between the four wheels (typically the space of the passenger compartment) and is a good proxy for the utility of a passenger car. Figure 1 illustrates the concept of the ‘footprint’ of a car.

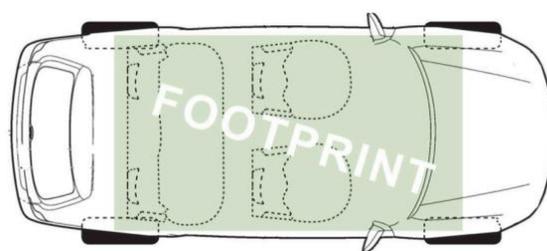


Figure 1: Footprint visualised

Footprint is widely recognised as superior to mass as a utility parameter.ⁱⁱⁱ In its 2011 report for the Commission, TNO concluded that “footprint can be objectively measured, is a better proxy for utility than mass, is used in the US legislation, has good correlation with CO₂, and is considered to offer less opportunity for gaming. As a result (...), footprint seems to be the favourable utility parameter.”^{iv} The Commission’s impact assessment says “that footprint is slightly more cost-effective than mass as the utility parameter”. Figure 2 compares the key characteristics of the mass and footprint approaches and shows footprint is superior to mass in 5 of the 6 criteria and equally practicable.

	Diversity competitively neutral, vertical spread	Robustness avoids perverse effects (gaming)	Flexibility no discrimination of technologies	Representativeness proxy for utility, socially equitable	Comprehensiveness avoid adverse effects, safety	Practicability data, continuous, definition, complexity
Curb weight	+	-	-	-	o	+
Pan area	++	-	+	+	+	o
Footprint	++	+	+	o	++	+

Figure 2: Assessment of different utility parameters^v

Why is a mass based system being proposed?

In the 2008 regulation, mass was adopted as the utility parameter because weight data were monitored and readily available, unlike footprint data. However, the 2008 law also mandated the collection of footprint data by car makers - which is now available. The 2008 regulation also required that the Commission review the utility parameter for 2013. The Commission decision is based upon a wish to minimise changes to the regulation for 2020 to provide regulatory certainty. However this briefing shows that providing manufacturers with the flexibility to choose between parameters would enable some to obtain the benefits of a footprint approach whilst retaining certainty for those that require it.

Why does mass metric reward heavier vehicles and discriminate against lightweighting?

The energy required to move a car is directly proportional to the weight of the car. Thus, the use of light materials (e.g. light-weight steels, carbon fibre or aluminium) has a very significant potential to reduce energy use and CO₂ emissions. It is estimated that around 0.6% CO₂ emissions reduction is achieved for each 1% saving in total vehicle mass – or approximately 6 g/km CO₂ per 100 kg of weight-variation.^{vi}

Despite the obvious benefit of reducing vehicle weight (for both fuel economy and safety benefits), the average vehicle weight is increasing. Figure 3,^{vii} demonstrates that average vehicle weight has increased by more than 10% in just ten years. The main advantage of footprint compared to mass is that it does not discriminate against light-weighting as a CO₂ reduction strategy. Figure 4^{viii} illustrates how reducing weight is penalised under the current mass-based system. If a car maker

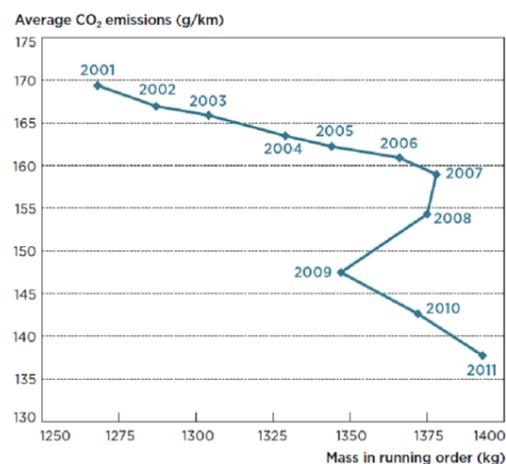


Figure 3: CO₂ vs weight evolution 2001-2011

reduces the average weight of his fleet his emissions go down but he will also get a tougher target (the lower the average weight, the lower the target). Thus, a significant part of the CO₂ reduction achieved through the use of lighter materials will be 'absorbed' by a tightening of the target. That makes light-weighting a particularly unattractive CO₂ reduction strategy under the current regulatory framework. In contrast, the full penalty (in terms of CO₂ emissions) of making the car heavier is not reflected since the company target is also relaxed. Using a mass utility parameter is therefore not technologically neutral.

The use of lighter materials will become more important as car makers shift towards electric-drive, since lighter vehicles would require less power and smaller (and thus cheaper) batteries. The use of light-weight materials therefore facilitates the move towards electric vehicles since the cost of batteries will to a large extent determine whether electro-mobility is a viable option.

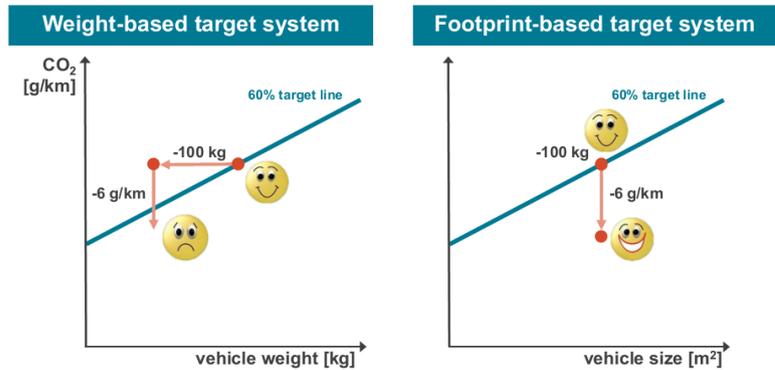


Figure 4: Effectiveness of lightweighting under a mass or footprint system^{ix}

Are there losers if we move to a footprint based system?

No. The choice for mass or footprint only marginally affects the stringency of car makers' targets.^x For most, in particular the volume carmakers like Volkswagen Group, PSA, GM, Toyota and Hyundai, the change would be in the 0-1% range. Although some car makers would receive slightly tougher targets, (as shown in Figure 5) this increased stringency would be more than offset by the fact that light-weighting would now become an attractive and cost-effective CO₂ reduction strategy. According to the ICCT, on average the costs for achieving the 2020 target would be 30% lower.^{xi}

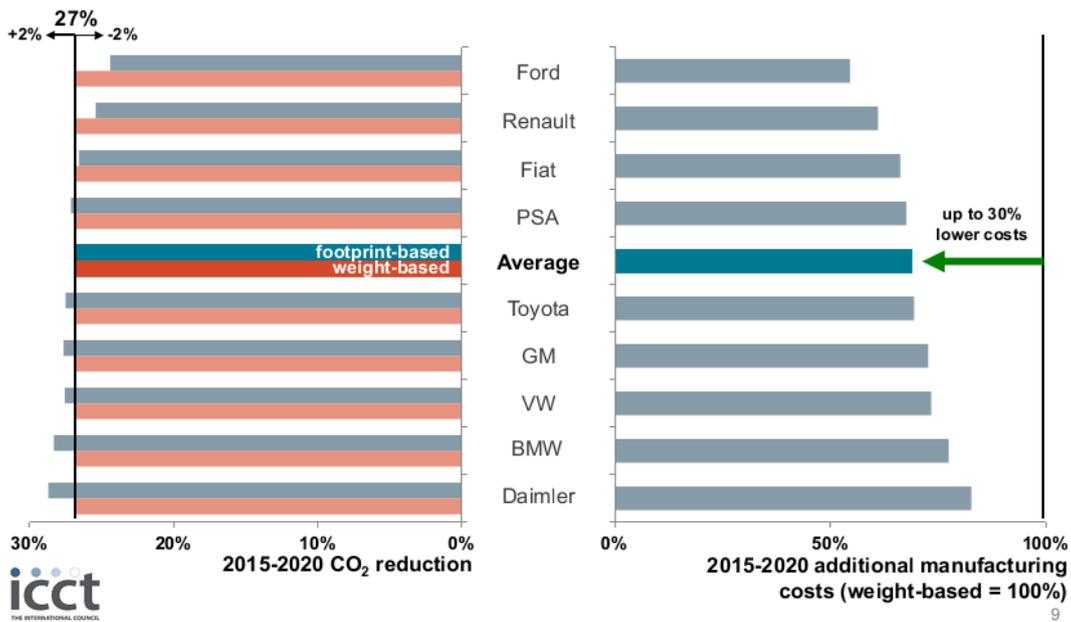


Figure 5: Impact of footprint on individual car makers

The way forward

Changing the utility parameter would be technically simple, would not entail a significant additional administrative burden, would have a limited impact on the distribution of efforts between carmakers and would not endanger planning certainty. Most importantly, it would bring down the cost of compliance for all manufacturers by fully rewarding light-weighting. It is clear that footprint is a better utility parameter than weight and T&E advocates a switch to footprint from 2015.

Given the available scientific evidence and the Commission's own impact assessment, its choice not to change the utility parameter is unfortunate. The Commission justifies its inaction by saying that "a change from mass runs against the objective of ensuring certainty for industry if the change were to be made for implementation of the 2020 targets." Despite this, "a debate on a future change to footprint" is still deemed to be "desirable".^{xii} This briefing is seeking to stimulate this debate.

The argument of planning certainty is unconvincing. Since the specific emissions targets of the car makers are only marginally affected, the impact on planning certainty of moving to footprint would be very limited. However, T&E recognises this remains a concern for some policy makers. T&E therefore supports suggestions for a "dual system" that would enable carmakers to choose whether to use a mass or footprint metric until 2020 and mandates footprint for post 2020 targets.

Such a dual system would require the Commission to develop alternative targets for carmakers based upon both footprint and mass. Official footprint data are available and could be used for this purpose. The slope of the two functions should be the same 60% so the distribution of efforts between car makers would be minimally affected. A 60% slope also reduces the risk of gaming. Carmakers would be given the choice whether, for their fleet, they wish to their target to be based upon a footprint or mass curve.

A potential downside of a dual system is that it could potentially lead to a slight weakening of the 2020 target. If all car makers were to move to footprint or stay with mass, the overall target would remain unchanged. However, if some manufacturers (i.e. the ones that would have a slightly lower target under a footprint based system – see figure 5) were to move to footprint, whilst others stay with mass the 2020 target would be marginally weakened by 0.6 g/km for a 60% slope. However, there is a strong likelihood that manufacturers switching to a footprint system would over-achieve their 2020 target, thereby eliminating any weakening.

The advantages of a dual system far outweigh the disadvantages. Under a dual system car-makers would be able to reach their 2020 targets in a more efficient manner, lowering costs to society. Moreover, this period of flexibility should serve as a phase-in period for a definitive change to footprint in 2025.

Conclusions and policy recommendations

This briefing demonstrates that footprint is a superior utility parameter to mass, notably because it encourages light-weighting. With a footprint system, reducing vehicle weight is highly cost-effective. A shift to footprint from mass is recommended either from 2015 or through allowing carmakers to choose which parameter to use as an intermediate solution from 2015 to 2020.

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ⁱ Regulation (EC) No 443/2009.

ⁱⁱ European Commission Climate Action 2012, COM/2012/393, Proposal for a Regulation to define the modalities for reaching the 2020 target for reducing CO₂ emissions from new passenger cars.

ⁱⁱⁱ Inter alia: Peter Mock (ICCT), *Evaluation of parameter-based vehicle emissions targets in the EU*, 2011; Malcolm Fergusson, Richard Smokers, *Footprint as a utility parameter*, 2008.

^{iv} TNO, Support for the revision of Regulation (EC) No 443/2009 on CO₂ emissions from cars, 2011, p16.

^v ICCT 2011, p44.

^{vi} Ibidem iv, p85.

^{vii} ICCT presentation, Effective Solutions to “Lighten the Load” (EAA lunch debate) 7/11/2012

<http://www.alueurope.eu/wp-content/uploads/2012/11/ICCT-presentation-2012-11-07-EP-Event.pdf>.

^{viii} Ibidem,

^{ix} Ibidem vii.

^x ICCT 2011, p46.

^{xi} Ibidem v.

^{xii} Impact Assessment accompanying proposal to review Regulation 443/2009 and 510/2011 , p57. <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=SWD:2012:0213:FIN:EN:PDF>.