

Do car scrapping schemes help the environment and increase safety?

A comparative study of three national car scrapping schemes carried out by the International Transport Forum indicates that:

- ▶ Car fleet renewal schemes can reduce CO₂ emissions and air pollution and can contribute to making roads safer
- ▶ But the gains are insufficient to make up for the value of the scrapped cars - in some cases the net losses were large
- ▶ Claims of reduced environmental impacts and improved safety should not serve as the main argument for scrapping programmes
- ▶ Schemes can be better designed to maximise their environmental and safety impacts

The issue

One of the earliest and most visible signs in late 2008 of the impending global economic recession was the sudden buildup of unsold cars in many countries as households drastically curtailed spending.

Alarmed by the spectre of large-scale failures in the automotive industry, many governments implemented incentivised fleet renewal - or scrapping - schemes where consumers received sometimes substantial cash payments or discounts for trading in their old car for a new one.

Authorities hoped that these incentives would stimulate consumer spending and assist car manufacturers and dealers in times of economic duress. Proponents of fleet renewal schemes also claimed that substantial environmental and safety benefits make these schemes attractive. Following on previous International Transport Forum work undertaken in 1999 that highlighted the high cost of addressing environmental goals through such schemes, we sought to revisit these claims.

The employment or stimulus-related benefits of selected car fleet renewal schemes were not examined. The study focused on the cost-effectiveness of schemes in delivering CO₂ and NO_x emission reductions, and improving safety.

▶ **Why study the impact of car scrapping schemes?**

The analysis

Three representative schemes for which detailed transaction data were available were studied: the French *Prime à la casse*, the German *Umweltprämie* and the US *CARS* programme. Results are based on a detailed investigation of 2.8 million individual transactions simplified into three car classes which serve as the basis for the emissions and safety analysis. Declining yearly distance driven by cars as they get older as well as the introduction and penetration of selected environmental and safety-enhancing technologies were taken into account.

► **The German, French and USA cases**

All comparisons are made in reference to a base-case in which old scrapped cars would have stayed in the fleet longer and new cars would have been introduced later. Pollutant and CO₂ emissions only from the operation of the vehicles in question were considered, and not of those associated with vehicle manufacturing and disposal. Finally, all lifetime pollutant and CO₂ reduction benefits were monetised, added to the monetised safety benefits, and then compared with the value of the scrapped car to see if the former outweighed the latter.

► **Monetising impact**

Two points should be noted:

1) As vehicles get older, they are generally driven less. Conversely, new vehicles tend to be driven more than older vehicles. Thus, while new vehicles may emit less than the older vehicles they replaced and may have more advanced safety features, the fact that they are driven more somewhat erodes these gains.

► **Intensive use of new cars erodes gains**

2) Vehicle scrapping schemes generally serve only to advance purchase decisions that would have otherwise taken place at a later date. The main impacts of fleet renewal schemes stem from *early* fleet replacement compared to the “business-as-usual” case. The end of fleet replacement schemes are often accompanied by a drop-off in car sales.

► **Subsidies lead to advanced purchases**

The findings

The selected schemes display different incentives and design characteristics:

- The US scheme used differentiated payments based on fuel economy to incentivise the purchase of more efficient new cars. It included a maximum age limit to help ensure that surrendered vehicles were still in use.
- Germany allowed some used vehicles to qualify for purchase incentives. The only requirement on a new car was that it met emission levels set for all new cars sold in Germany.
- France used CO₂ emissions to guide new vehicle purchase. But while the 160g/km limit value might constrain the choice of certain gasoline-driven vehicles, it essentially allows for all but the very largest diesel cars to qualify.

► **Comparison of incentive structures**

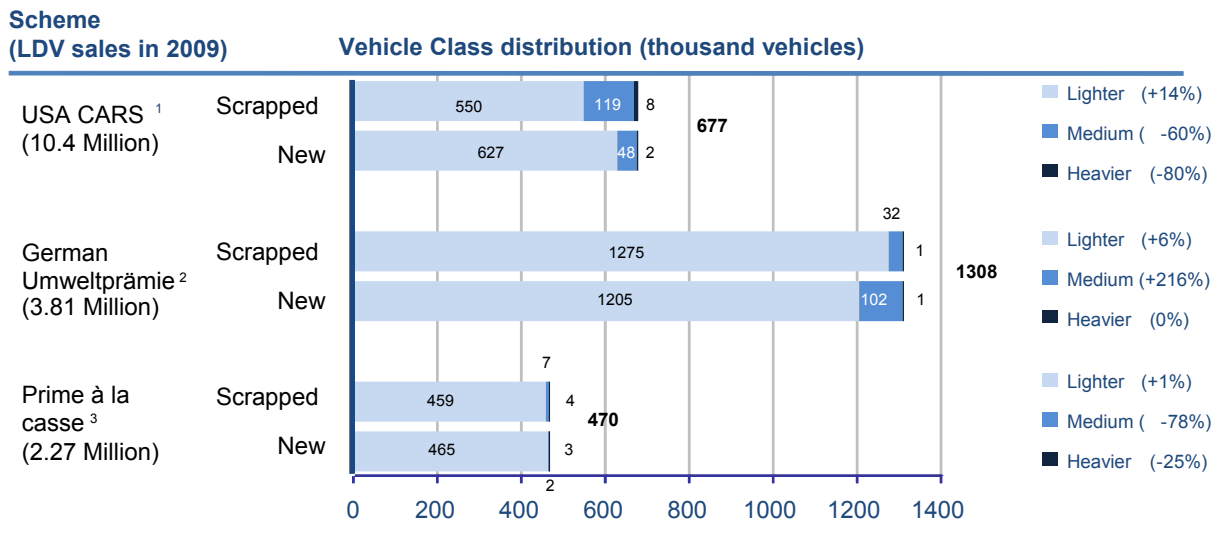
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According to our estimates, the CARS programme (USA) impacted 0.3% of light duty vehicles and roughly 0.2% of the corresponding vehicle-km-travelled (VKTs). In Germany, the figures were 3.6% and 2.0% respectively - more vehicles were involved - and the total vehicle fleet is smaller.

In France, these figures were 1.5% and 0.75% respectively. In the USA and France, consumers traded larger old cars for smaller new cars (or small old cars for new small cars). In Germany, in contrast, there was a significant shift from lighter to heavier car classes¹.

► Shift from lighter to heavier cars in Germany

Figure 1. Vehicle class⁴ shift effects



LDV=Light-duty vehicle

¹ Figures available as of 3/2010. Final programme figures report 678 000 vehicles, but the calculations used here were not corrected to account for this since the difference was minimal.

² Latest available class figures as of 4/2010, referring to 3/11/2009. For the calculations, latest aggregate figures were used (refers to 5/1/2010): 1 658 000 vehicles. Maximum budgeted capacity: 2 million vehicles.

³ Transactions with usable data. For the calculations estimated global figures were used: circa 550 000 vehicles.

⁴ Simplified vehicle classes have been used that were applicable to both US and EU cases rather than national vehicle class categories.

In the USA, the CARS programme brought about a 35% improvement in fuel consumption for the new fleet in comparison with the scrapped vehicles. The *Umweltprämie* in Germany involved a larger number of vehicles, but the class shift reduced the overall benefits. The purchase subsidy was not associated with fuel consumption, and the only requirement was that the pollutant emission class of the new vehicles should be at least Euro 4 – which in principle should be the case for any new light duty vehicle sold from 2005 onwards.

In France, the requirement to have a type-approval CO₂ emission value of 160g per km or less may have contributed to the slight class shift from medium-sized vehicles towards lighter vehicles.

¹ Since the vehicle classes, in particular the "lighter" one, still include a somewhat broad spectrum of vehicles types and corresponding emission factors, findings were adjusted using expert judgement and some sampling in the scrapped and new fleets to balance the emission factors towards the actual transactions recorded within each scheme.

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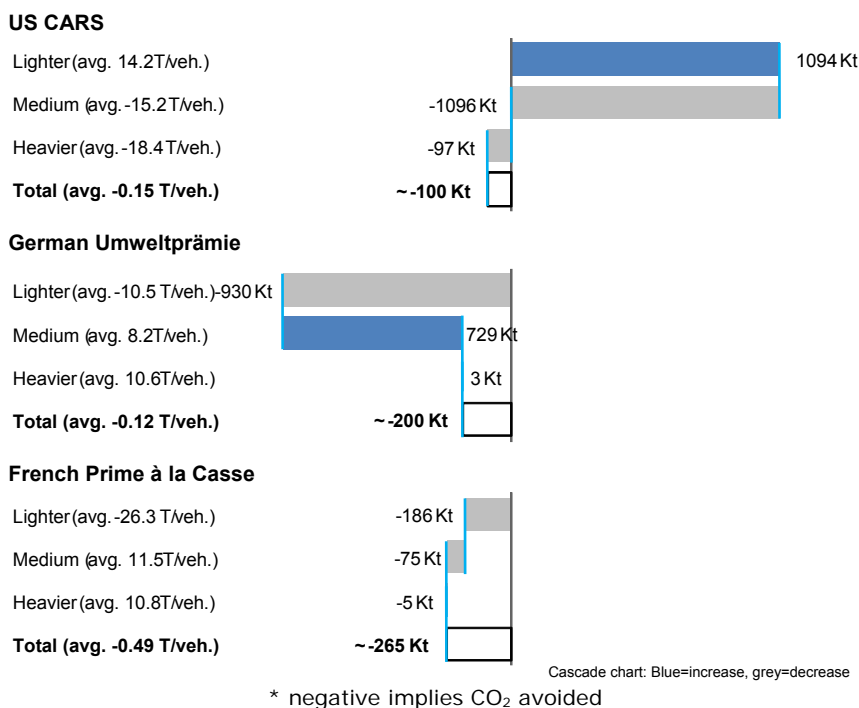
Impacts on CO₂ emissions

The CARS programme achieved a 0.005% reduction in total CO₂ emissions from light-duty vehicles in 2010. The figures for the German and French schemes are an order of magnitude higher, 0.05% and 0.06% respectively. In the USA, the reduction in total CO₂ emissions from medium-sized vehicles is almost cancelled out by an increase in total CO₂ emissions from lighter vehicles.

► Different magnitudes in impact on CO₂

In Germany the class shift towards heavier vehicles undermined CO₂ reduction.

Figure 2. **Cumulative and average per-vehicle CO₂ impact (2010 to 2030 by vehicle class*)**



In France, all vehicle classes contributed to reducing CO₂ emissions. This is due to a class shift where heavier and medium-sized vehicles were replaced with lighter ones in line with the requirement that new vehicles emit less than 160g CO₂ per kilometre. The new light vehicles include a very large share of modern diesel cars with very low fuel consumption.

Effects on NO_x emissions

Our analysis indicates that all three schemes reduced NO_x emissions. The impact in 2010 is estimated at 9 000 tonnes for the USA, 7 000 tonnes for Germany and 3 000 tonnes for France and cumulative impacts are estimated at minus 65 000 tonnes for the USA, minus 32 000 tonnes for Germany and minus 12 000 tonnes for France.

► Positive effects on NO_x

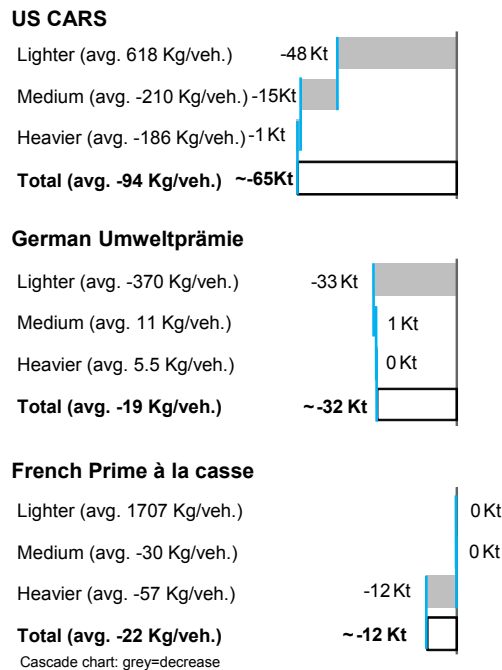
In the USA, both medium and light-sized vehicles contribute to the total NO_x impact. This is due to generally improved real-world emissions per vehicle,

► More diesel cars erode NO_x gains

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which have decreased substantially for new vehicles since 2000. In Germany, the increased share of medium-sized cars in the fleet slightly eroded NO_x emission gains from new lighter vehicles. In France, the large number of new diesel cars eroded lifetime NO_x gains from what they otherwise might have been.

Figure 3. **Cumulative NO_x impact 2010 to c. 2025 compared to “business as usual” scenario (by vehicle class)**



* negative implies avoided NO_x

Improvements in safety

Our analysis suggests that the road safety impact of the US CARS programme over the period 2010-2030 could reach c. 2 800 serious injuries avoided, of which c. 40 would have been fatalities. In Germany, we estimate the cumulative road safety impacts of the *Umweltprämie* to be c. 6 000 serious injuries avoided, of which c. 60 would have been fatalities. In France, the *Prime à la casse* is estimated to have resulted more modestly in c. 330 serious injuries (of which 20 fatalities) avoided.

► Diverging impacts on road safety

In the USA, we found that ESC (Electronic Stability Control) and the general vehicle safety improvement effect (incremental improvement of vehicle and infrastructure safety technology over time) accounts for 70% of the expected 2010-2030 impact.

In Germany, a higher percentage reduction in injuries from the “business as usual” (BAU) base-case is expected from each safety feature. Since penetration of these features in the scrapped vehicles was lower than in the USA, their broad introduction through the scheme is estimated to bring a stronger reduction in relation to the BAU injury levels. However, lower overall road injury figures, as well as lower levels of vehicle travel, lead to only slightly higher improvements in avoided injuries compared to the USA.

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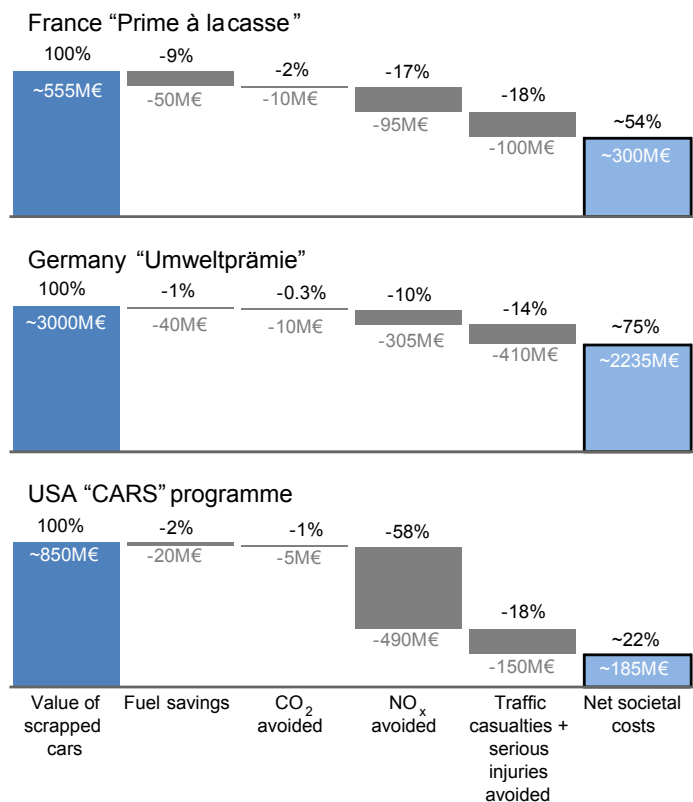
In France, the estimated safety impacts are very limited for several reasons; because of the smaller scale of the scheme, low expected remaining vehicle kilometres of travel of the scrapped fleet (because of a high share of very old cars), and a lower penetration rate of the safety features in the new cars in comparison with the other countries.

Cost effectiveness

From a societal perspective, the US scheme cost nearly EUR 1 billion in destroyed assets (scrapped vehicles). The largest monetised benefit examined here comes from avoided NO_x emissions (c. EUR 500 million), followed by avoided casualties (c. EUR 150 million), fuel savings and CO₂ avoided, leading to a total quantified recovery of c. 80% of the societal cost (represented by the value of the scrapped asset).

► Only approx. 80% of societal cost recuperated in US

Figure 4. **Cost-effectiveness of selected fleet renewal schemes**



Given that other possible benefits of the scheme were not quantified and accounting for the uncertainty associated with some of the numbers (e.g. the average value of the scrapped cars), the US scheme may have had benefits in line with its costs.

► Even poorer results in Germany and France

On a per-vehicle basis, the German scheme achieved lower benefits than the US scheme in terms of CO₂, NO_x and safety impacts. It was therefore less cost-effective and the CO₂, NO_x and safety benefits represent only around 25% of the estimated costs.

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The French scheme succeeded in targeting the right vehicles for scrapping and resulted in an estimated cost recovery of around 45%. But societal benefits could have been enhanced through a more ambitious NO_x reduction effort, as NO_x emission mitigation recorded the greatest monetised benefits in the US and German schemes.

See also:

[Car Fleet Renewal Schemes: Environmental and Safety Impacts](#). France, Germany and the United States (ITF/FIA, 2011)

[Cleaner Cars: Fleet Renewal and Scrappage Schemes](#). Guide to Good Practice. (ECMT 1999)

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