German Environment Agency

21. November 2025

AutoRess Factsheet 5: Downsizing of new electric cars

Results from the project 'Resource efficient and circular electric cars' (AutoRess) – FKZ 3722 57 101 0

Key findings

The **average weight of new cars has risen steadily over the past few decades**, both due to a shift toward higher purchase segments and due to heavier models within the segments. Electromobility is providing an additional boost to the increase in weight due to their heavy batteries.

Downsizing of cars saves greenhouse gases and raw material consumption, even with increasing electrification. Downsizing is primarily a question of market supply and demand, it does not require fundamental technical redevelopments of new vehicle concepts.

Measures for downsizing should address equally private and commercial car purchases, including financial incentives at the national level (e.g., bonus-malus), for selected user groups (e.g., company car taxation), as well as public procurement requirements or local parking regulations.
Japan shows that small vehicles can be successfully promoted. Kei cars benefit from financial advantages at the national and local level, as well as exemptions from legal parking space requirements, having a new car market share of around 40 %.

Key measures

Downsizing is much more than a technical issue. It is a political and social challenge: it is about realigning markets, purchasing incentives and infrastructures - towards mobility that does not focus on size and performance, but on efficiency, responsibility and resource conservation. A key to downsizing lies in particular in financial advantages for small cars within the framework of national and municipal regulations, as well as in other user benefits, especially when it comes to parking. Key measures, identified in AutoRess and other studies include:



In a **bonus-malus system based on vehicle dimensions**, buyers of a smaller car receive a bonus, whereas a malus must be paid when buying a car with higher dimensions, which also increases with increasing size.



Targeted incentives for commercial car purchases (e.g., via company car taxation and depreciation rules) are highly relevant measures, as around two-thirds of all new registrations are commercial.



Promoting or binding specifications for sustainable vehicles in public procurement should include a needs-based dimensioning of vehicles. The **tools and requirement catalogs** used in procurement practice can also be used in the private sector, thus providing assistance for a large proportion of the passenger car market.

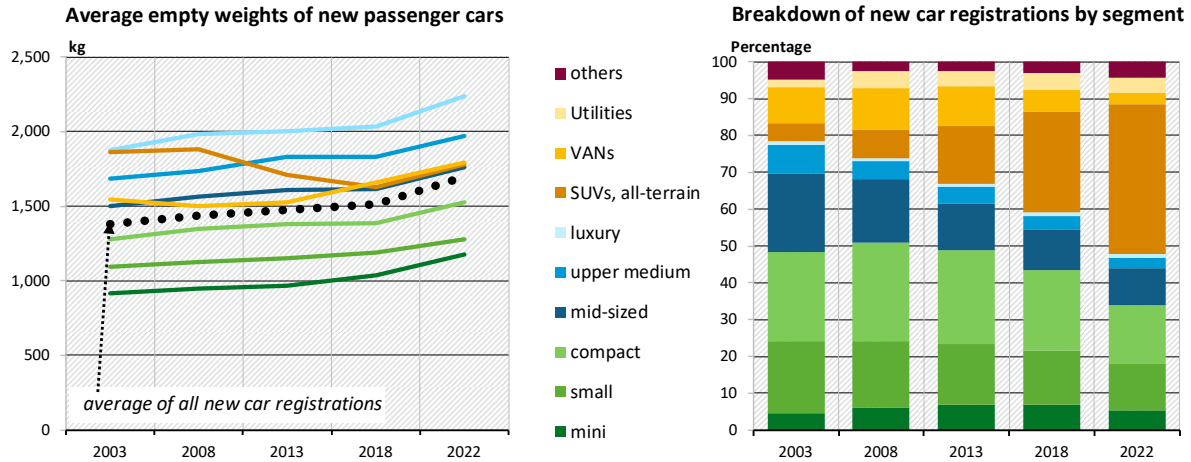
In some cities in Germany, owners of small cars save money on **resident parking fees** compared to owners of large cars. However, local incentives for small cars (e.g., lower fees, special public parking spaces) are limited by the legal framework in Germany. Additional legal powers, such as the Kei car regulations in Japan, would enable local authorities to offer additional benefits to owners of small cars.

Detailed information on all key measures for resource efficient and circular electric cars can be found in the final report in Chapter 5. Additional information on public procurement can be found in factsheet 11 “Procurement (for politics) and in the summary paper “Procurement for practitioners (DE)”.

Vehicle downsizing is an effective lever for reducing both GHG emissions and raw material requirements

In the past, there has been a clear trend towards growth in passenger cars. The average empty weight of new cars in Germany has increased by around 23 % in the last 20 years from about 1,400 kg to 1,700 kg. This results both from the increasing market shares of larger vehicle segments and from a shift towards higher empty weights within the existing segments. Electromobility is providing an additional boost to the increase in weight due to their heavy batteries. This trend is also reflected in the global vehicle markets. Various sources expect further increases of vehicle sizes in the future. The increasing size of vehicles (over)compensates for efficiency gains in the powertrain. This means that potential energy savings and greenhouse gas reductions in vehicle operation are not realised. At the same time, the material requirements of new cars and therewith the raw material consumption also increase.

Average empty weights of new cars and the percentage breakdown of new registrations by purchase segment in Germany 2003-2022



Source: own illustration, based on KBA statistics

A reversal of this trend, i.e. a downsizing towards smaller vehicles with smaller and fewer components, would bring clear environmental benefits both in the operation and manufacture of passenger cars. A shift in new vehicle sales towards small or micro cars, would lead to significantly lower GHG emissions and lower resource consumption. An additional 15 to 33 % share of new registrations for small or micro cars would reduce the overall annual material requirement in car production by up to 16 percent. This also applies to electric cars: downsizing, especially of battery capacities, not only reduces the demand for renewable electricity for car operation, but also significantly lowers the ecological footprint of car production. An additional local benefit of downsizing would be the reduced parking space requirements in cities.

Downsizing is primarily a question of market supply and demand, not of fundamental new technical developments

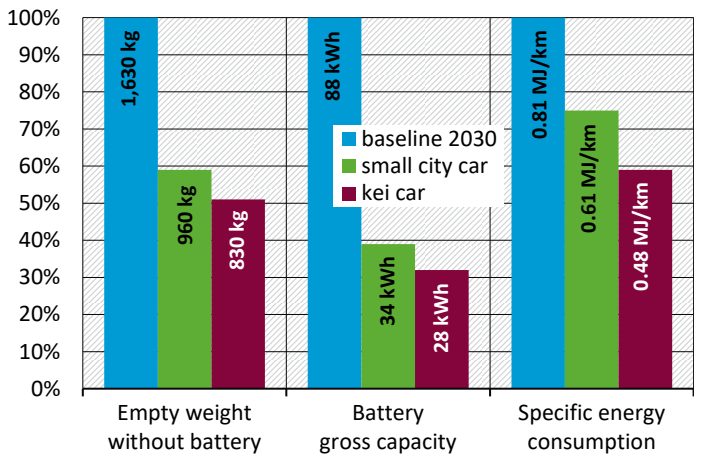
Evaluations show that the increasing vehicle sizes are partly determined by safety optimisations and legal requirements. However, the majority of growth is driven by the customers' demand for more comfort, additional equipment and larger vehicles. This is also promoted by manufacturers, for whom large models are more profitable. Analyses show that the number of small car models available on the market has fallen significantly in recent years. Accordingly, downsizing is less a technical issue, but primarily a question of market supply and purchasing behaviour.

A reorientation of the car market towards smaller vehicle segments that consume less energy and material is necessary. Purchasing behaviour of both private and commercial customers plays a decisive role here. Around two thirds of all new registrations in Germany are accounted for by companies, including car rental companies, fleet operators or retailers. A large proportion of these vehicles enter the private used car market after a short time and shape the vehicle population in the long term. Differences in purchasing behaviour between individual commercial sectors show that the vehicle classes and equipment selected also depend on the respective usage context.

Downsizing does not require the technical redevelopment of completely new vehicle concepts. Smaller vehicle segments are already available today. The analyses of downsizing potentials in AutoRess focus on a shift in the new electric car market towards the following vehicle concepts:

- **Small/mini cars** are already established on European market and account for around 5% of new registrations in Germany, although its market share is trending downwards.
- **Japanese kei cars** are fully-fledged micro cars that are particularly popular in Japan. Despite their small size, they offer modern comfort and safety and make up around 40 percent of the Japanese vehicle fleet. These vehicles offer also interesting potential for the European market, not only in urban environments.
- **L7e light motor vehicles** are lighter and less expensive, but do not meet the requirements to be perceived as a fully-fledged car alternative and were not analysed in detail in AutoRess. They offer only limited comfort and safety, usually only two seats and low top speeds with a focus on inner-city use. Their current market share is negligible.

Configuration of downsized cars compared to average new car in 2030 in the AutoRess model



Source: own illustration (ifeu)

With mini cars or kei cars, vehicle weight of individual cars can be reduced by 40 to 50 % compared to today's average for new registrations. With a focus on primarily urban use and thus a lower required range, GHG and resource-intensive battery capacities could even be reduced by 60 to 70 %. Energy consumption and thus the amount of renewable electricity required is also greatly reduced by downsized cars.

Detailed information on trends, fields of action and on the modelling of downsizing of new electric cars in AutoRess can be found in the final report in Chapter 3.3.

We can learn from Japan's experiences

The legal framework in Europe has so far offered hardly any incentives for smaller vehicles. No incentives exist for small electric cars at all since only direct emissions from vehicle operation are regulated. France has introduced weight-based penalty taxes for cars with combustion engines, but these do not apply to electric cars. New safety regulations are also likely to lead to further weight increases in the future.



Source: own illustration (AI-generated)

In Japan, on the other hand, kei cars account for around 40% of the new vehicle market and the existing fleet. The main reason for this is the significant financial advantages they offer, e.g., automobile weight tax, annual vehicle tax, reduced toll rates on highways and expressways, reduced parking fees in public parking lots and garages (parking on public roads is generally prohibited in Japan). Also, owners of standard passenger cars are generally required to prove that they have a private parking space to register their vehicle. Kei cars are exempt from this parking space requirement in rural areas and smaller towns. In metropolitan areas, kei cars were also often exempt from the parking space requirement in the past. This requirement now also applies to kei cars, but due to their smaller size, the requirements and the costs for a parking space are significantly lower.

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Based on the final AutoRess report. All AutoRess documents are published on http://umweltbundesamt.de/themen/verkehr/ressourcenschonung-im-verkehr

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