German Environment Agency

19. November 2025

AutoRess Factsheet 3: Vision of a resource-efficient vehicle

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

Key findings

The AutoRess project developed a vision for a resource-efficient vehicle. This vision is based on purely battery-electric passenger cars. These are considered resource-efficient and suitable for the circular economy if they meet the following conditions:

- The vehicles require as few primary raw materials as possible over their entire life cycle.
- The vehicles consume as little energy as possible over their entire life cycle.
- The vehicles emit as few greenhouse gases as possible over their entire life cycle.
- The vehicles are as durable as possible.
- At the end of their life, the components can be returned to the material cycle as completely as possible and without downcycling.
- The additional environmental and social impacts over the entire life cycle are as minimal as possible.

Levers for reducing raw material requirements and greenhouse gas emissions

The modeling of resource use and greenhouse gas emissions in the automotive industry carried out in the "AutoRess" project identified three levers that have a particularly strong impact on the targets:

- Reduction in vehicle and battery size
- Extension of service life
- Increasing the amount of recycling and recycled content

Savings through a shift to public transport or non-motorized modes of transport (e.g., bicycles) were not examined in the AutoRess project.

The resource-efficient vehicle

One of the characteristics of a resource-efficient vehicle is that it meets the specific requirements of the user as precisely as possible without exceeding them. This means that the smallest vehicle with the range required for everyday use and thus the smallest battery size and the minimum necessary special equipment is purchased. An ideal resource-efficient vehicle therefore first questions the appropriateness of existing vehicle classes.

In order to save resources and greenhouse gas emissions as efficiently as possible, compromises regarding the necessary safety measures could be justified, especially for vehicles that are used exclusively in cities. However, there is a significant gap in the vehicle classes for lighter vehicles.

Figure 1: Renault Twizy from the L7e vehicle class



Source: Mariordo, Wikimedia Commons[1] , CC BY-SA 4.0

While microcars (class M1) generally weigh more than 1000 kg due to safety regulations, electric vehicles in classes L7E/L6E, which are subject to very strict weight restrictions (max. 450 kg), are often perceived by users as not being safe enough. It has therefore been proposed to close this gap by introducing a new vehicle class ("M0") that is particularly suitable for urban and suburban regions, is subject to weight and size restrictions, and still has basic safety features. Since collision speeds in accidents involving this target usage profile are consistently lower, deformation spaces in the M0 class in particular can be designed to be much smaller and lighter without increasing the risk of injury.

To achieve this, an ideal battery-electric vehicle for urban traffic would be less than 2.39 m long and less than 1.32 m wide, and for interurban traffic for a family with luggage, less than 4.5 m long and less than 1.85 m wide. It would consist of 100% secondary materials, have a guaranteed durability of 20 years, including spare parts availability and software updates, and would also be optimized in terms of repairability. This requires that all vehicle parts (especially those that can break or wear out quickly) are easily accessible and replaceable. This total modularity will also promote the recyclability of the components and materials used in the vehicle by facilitating the dismantling of parts before the body is shredded at the end of its service life. Software and hardware upgrades are guaranteed for the entire service life of the vehicle.

[1] https://commons.wikimedia.org/wiki/File:Autolib_Paris_04_2016_7374.JPG (November 19, 2025)

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