



Safety of four-wheeled lightweight electric vehicles

New Zealand could be cleaner and greener by replacing larger vehicles with lightweight EVs for short urban trips and urban freight delivery.

But are they less safe than traditional cars and vans?

The researchers in this study wanted to learn from overseas experiences of four-wheeled lightweight electric vehicles (lightweight EVs) as New Zealand legislation does not allow these lightweight vehicles to be used on our roads. This research can help us understand

the benefits and safety risks of changing our laws to allow (or not allow) them on New Zealand roads.

Here are their main findings.

Regulation and enforcement

In Europe, Japan and the USA, the type and amount of regulation of these lightweight EVs is very different between:

- how they categorise vehicles
- protection standards for their occupants and vulnerable road users
- which roads they can use.

In Europe they're known as quadricycles, and, unlike cars, don't need to meet crash test requirements. It's also the only region that doesn't restrict usage on higher-speed roads like motorways or expressways.

Japan is the only place where lightweight EV safety standards are similar to other passenger cars. The fact that major manufacturers supply EVs that meet these standards demonstrates that car-like safety standards can be enforced without making EVs as heavy, inefficient, and expensive as other passenger cars.

The USA regulates lightweight EVs far less than other regions. The main restrictions only cover weight, top speed, and the types of road they can be driven on.

Numbers of lightweight EVs, their benefits and costs

We can't easily compare the current and former fleet sizes of the UK, Germany and France because of reporting differences and data gaps. However, we know that France has the largest total fleet size, followed by Germany and then the UK, which has the smallest fleet by far.

The literature review found that along with other sustainable travel modes, quadricycles are a promising clean mobility solution to the growing climate crisis. They also help promote public transport use and last mile connectivity. Japan is considering quadricycles to help decarbonise transport and to help mobilise older people and those living with disabilities. The UK plans to transition all road-use quadricycles to zero emission in the coming years.

New 'microcar' models are entering the market, which shows that some manufacturers see the economic potential of these vehicles. However, some other manufacturers have pulled out of the market because it wasn't profitable enough.

Overall, the sustainability benefits and low cost of using quadricycles hasn't resulted in more lightweight EVs on the roads in recent years. In fact, sharp decreases are shown in the UK and Germany, while numbers in France have been relatively stable over the last decade. It seems that buyer trends, market trends, and laws and regulations will shape the future markets for these EVs.

Safety

The safety of quadricycles is debated. European regulations are much less strict for quadricycles than for most other vehicles, and their crash safety is a valid concern.

Collision and casualty data from France, Germany and the UK show that quadricycles only add a small fraction to overall road casualties because there are far fewer than traditional passenger cars. However, the casualty rates (the number of killed or seriously injured occupants per million vehicles) show that they're less safe than passenger cars (by 47% to 280%) but safer than motorcycles (by 14% to 71%).

This means total casualty numbers could greatly increase if many road users change from cars to quadricycles and the safety standards stay at current European Union levels. However, we need more data to confirm this.

Detailed accident information is sparse for these vehicles.

- In the UK, more than half of quadricycle crashes involved another vehicle (usually a car), followed by single-vehicle collisions (some of which involved a pedestrian). The smallest group was crashes involving two or more other parties.
- In France, approximately three quarters of people killed or seriously injured were drivers, which is to be expected because the driver is usually the only occupant.

To understand the safety risks of lightweight EVs, we need more research on how they are used and the types of people who drive them.



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