Waka Kotahi research summary
November 2022

Electric bus noise and road user safety

Reducing sound from the urban environment is good for wellbeing, and electric vehicles are quieter and less polluting. However, many people rely on vehicle noise for safety and ride-hailing. Are acoustic vehicle alerting systems the solution?

Electrifying public transit might radically benefit cities because bus fleets are continually driving and diesel bus engines are loud. However, quieter buses may affect the safety of pedestrians who depend on sight and sound to detect buses coming – particularly those with low hearing and low vision.

Acoustic vehicle alerting systems – a solution?

Acoustic vehicle alerting systems (AVASs) make noise from electric vehicles so that pedestrians can hear them coming. This could make electric vehicles more detectable to pedestrians.

In this report, researchers did a literature review and two studies to see if AVASs are needed on electric buses in New Zealand.

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Literature review

No studies were found on how detectable electric buses are to pedestrians, or how AVASs improve their detection. Some research was found on detection of electric cars and electric trucks. Generally, researchers found that:

- electric vehicles are less detectable at speeds lower than 35 km/h
- pedestrians were more likely to be hit by electric vehicles than by vehicles with internal combustion engines.

Quieter vehicles are also a known concern for low vision or blind people.

Studies

The researchers completed two studies.

1. They measured noise differences between electric and diesel buses in New Zealand at 10, 30, and 50 km/h.
2. They measured people's ability to detect buses in urban street environments.

In the first study, they found that electric buses were approximately 8 dB quieter than diesel buses at 10 km/h, but there was no difference at 30 km/h. Electric buses were slightly louder than diesel buses at 50 km/h.

In the second study, they asked low-vision and non-disabled participants to listen for approaching diesel and electric buses in Auckland and Wellington. The researchers measured how far away the buses were when participants detected them.

In Wellington, there was no significant difference between electric bus and diesel bus detection distances or rates.

In Auckland, however, participants were more likely to detect a diesel bus than an electric bus, and on average they detected diesel buses earlier. There was considerable overlap in the data in both cities.

The low-vision and non-disabled participants were similar at detecting approaching buses in both cities. However, in Auckland the low-vision participants were significantly less likely than the non-disabled participants to detect a bus early.

Recommendations and further research

Before adopting AVASs for all electric buses, more research is needed to understand bus detectability and how effective AVASs are in different New Zealand soundscapes.

The researchers recommend both laboratory and field testing of possible AVAS configurations for New Zealand conditions. They also recommend improving street infrastructure to promote pedestrian safety, such as providing more formal crossing points to reduce the negative effects of bus noise.

Bus detection can also be improved by adding on-site detectability tools at bus stops, such as real-time alerts.

RR 703: Electric bus noise and road user safety, Waka Kotahi NZ Transport Agency research report. Available at **www.nzta.govt.nz/resources/research/reports/703**