ADIONA

Connected Thinking

An Adiona Tech report on Australian
transport electrification priorities

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Introduction

"The CO2 emissions of Australian road vehicles is staggering, but the ambition to electrify every car on the road requires connected thinking and collective action. We cannot transform the national fleet of 15m passenger and 5 million commercial vehicles overnight, so we first need to focus on the decisions that make the biggest difference, for the lowest effort and financial investment. We need a sensible, data-driven conversation about electric vehicle prioritisation to identify the low hanging fruit.

"The new National Electric Vehicle Strategy is a start, but it doesn't go far enough to help Australia catch up to other developed nations. It is also geared entirely towards passenger vehicles, at the expense of the biggest polluters on the road. Our data shows that consumer adoption of EVs should not be Australia's number one priority. Electrifying fleets is by far the most efficient way to reduce vehicle emissions. Every battery we put in a truck or van counts for 5 to 50 households buying an EV, and businesses often have hundreds of vehicles. Australia must prioritise the electrification of vehicles that are on the road most, travel the longest distances, and are the least fuel efficient.

"The electrification of the Australian fleet needs to run in parallel to other transport programs designed to reduce emissions, lower congestion and traffic, and make cities more liveable. Organisations like TfNSW is trying to reduce total kilometres driven, especially by passenger cars, while global transport agencies are committed to converting car drivers to public transport, cycling, and walking with an emphasis on creating 30-minute cities.

"Climate change and extreme weather events have devastated Australia in recent years, and the consequences of further inaction on vehicle pollution may be dire. In this report, we use data to explore how Australia should prioritise its vehicle electrification goals."

Richard Savoie
CEO and co-founder, Adiona Tech

Key Findings

- Electrifying 10 vehicles used for last mile delivery (e.g. rigid trucks) is as beneficial as 56 households purchasing an electric vehicle

- An Australian articulated truck travels 6x more kms than a passenger car annually, uses 40x more fuel and produces 50x more CO_2. They represent 1% of vehicles on the road, but 15% of emissions

- Vehicles in NSW, Victoria, and Queensland produce the most CO_2 emissions. Northern Territory produces the least CO_2 due to having the smallest distance travelled, but it is among the worst states for fuel used per km travelled, and one of the biggest adopters of diesel fuel (which produces more CO_2). The ACT is the most fuel-efficient state

- Every tonne of lithium mined for EV use has the potential to create 200 batteries. If used for passenger vehicles, they would eliminate 500 tonnes of CO_2 emissions every year. If these same batteries or materials are used by light commercial vehicles, they would save 900 tonnes of CO_2 emissions.

- Among freight vehicles, crude materials (except fuels) account for the most kms travelled on Australian roads. Because a significant proportion of these vehicles are smaller rigid trucks and light commercial vehicles (not articulated trucks), this industry would be more easily electrified than other industries (such as food/live animals and fuel/mineral transportation)

Distance travelled by commercial and passenger vehicles

According to the latest ABS annual vehicle survey, the average passenger vehicle travels 11,100 kilometres per year, which pales in comparison to non-long haul commercial vehicles and fleets, which travel 38-90% further each year (depending on vehicle type). Meanwhile articulated trucks travel 600% more kilometres than passenger vehicles each year.[1]

Passenger Vehicles
11,100 kms per year

Light Commercial Vehicles
15,300 kms per year

Rigid Trucks
21,100 kms per year

Articulated Trucks
78,000 kms per year

1 https://www.abs.gov.au/statistics/industry/tourism-and-transport/survey-motor-vehicle-use-australia/latest-release
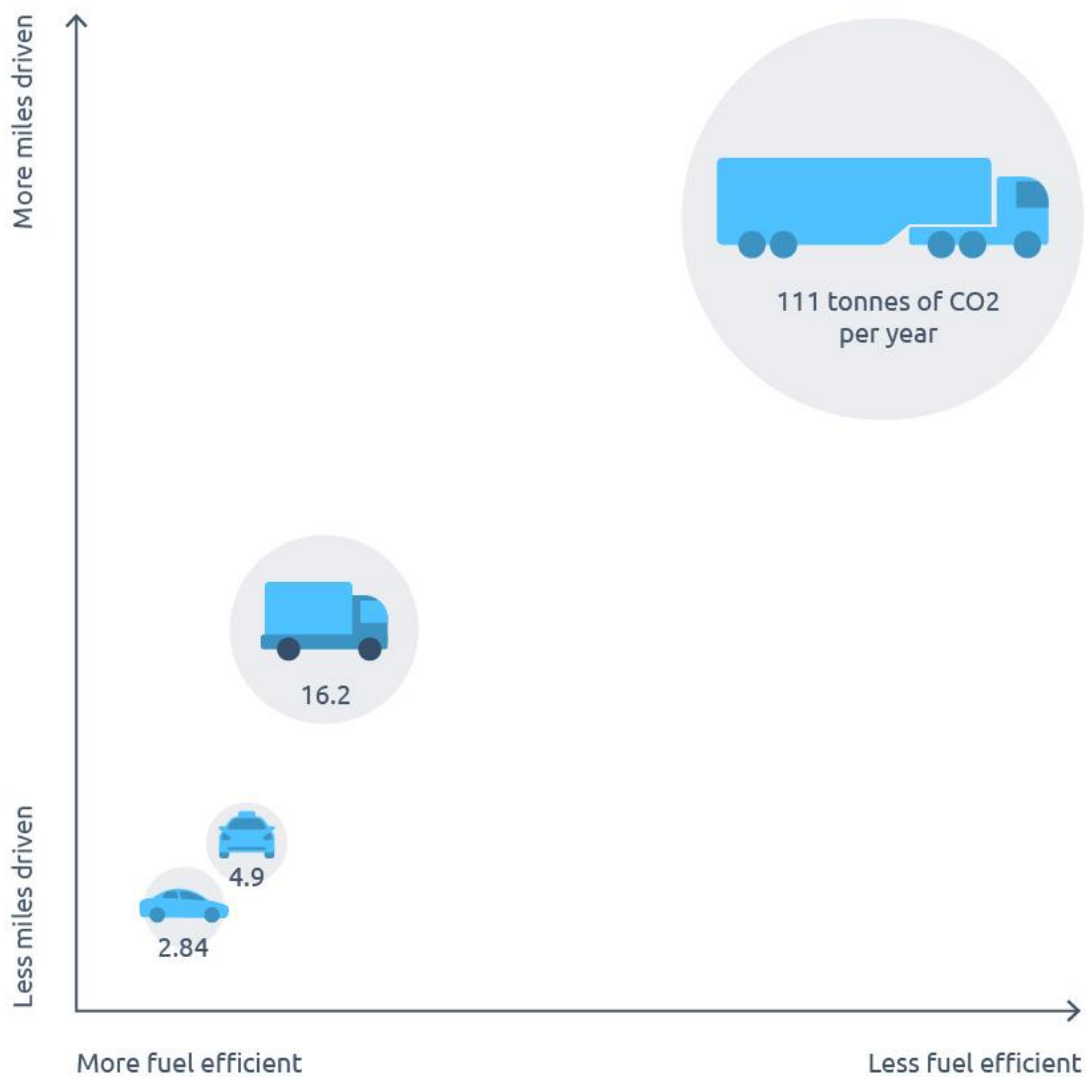
Emissions by vehicle type

A conservative estimate says that electrifying 10 delivery trucks would reduce CO2 emissions by an amount equivalent to 56 households purchasing an electric vehicle – based on kms driven, fuel efficiency, fuel type and CO2 emissions[2]. Given the lower utilisation rates of passenger cars (compared to fleets), this figure may be even higher.

10 electric delivery trucks   =   56 electric passenger vehicles

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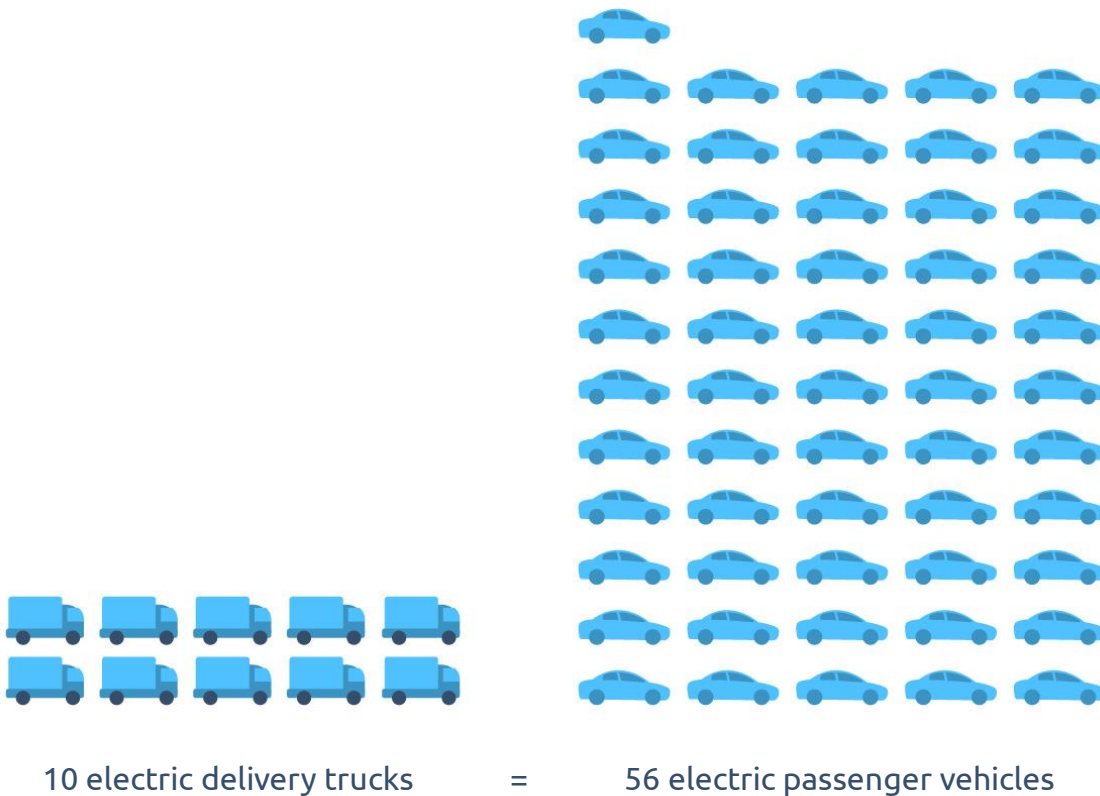
[2] ABS motor vehicle use survey provides data on kms driven, fuel use, kms per 100l of fuel and fuel type. According to Michelin, diesel produces 2.68 Kg of CO2 per litre, and petrol produces 2.31 Kg of CO2 per litre https://connectedfleet.michelin.com/blog/calculate-co2-emissions

We can calculate how much fuel and CO2 emissions are produced by all different vehicle types in Australia. These figures are even more jarring than the kilometres driven figures, and there is an even bigger gap between passenger and commercial vehicles. Commercial vehicles are often larger, heavier and less fuel efficient than their passenger counterparts. They are also far more likely to use diesel, which produces more CO2 than petrol.

111 tonnes of CO2 per year

16.2

4.9

2.84

More fuel efficient   Less fuel efficient

More miles driven

Less miles driven

> Not only do commercial vehicles travel more, they also create more emissions per km travelled. This data underscores the need to electrify fleet and freight vehicles urgently. Ideally, we would start by electrifying the least fuel-efficient vehicles, which spend the most time on the roads.

— Richard Savoie
Adiona Tech

More delivery vehicles on the road

There are far more passenger vehicles on the road than freight or transport vehicles. However, to satisfy consumer demand for online purchases with next day or instant delivery, the number of delivery vehicles in major cities is anticipated to soar. The World Economic Forum estimates that delivery vehicle numbers will increase by 36% until 2030[3]. Unless these fleets are electrified, this will increase emissions from delivery traffic significantly. It will also increase congestion and commute times unless governments can find ways to incentivise public transport, or reduce the number of vehicles in city centres (e.g. via low emissions zones or London's new cargo bike action plan[4]).

While delivery or freight vehicles currently make up a small fraction of all vehicles in Australia, they make up a significant proportion of emissions. Articulated trucks, for example, make up only 1% of vehicles on the road, but produce 15% of total vehicle emissions in Australia. If more Internal Combustion Engine freight and delivery vehicles are put on the road as per the WEF predictions, they could make up an even bigger proportion of Australian vehicle emissions.
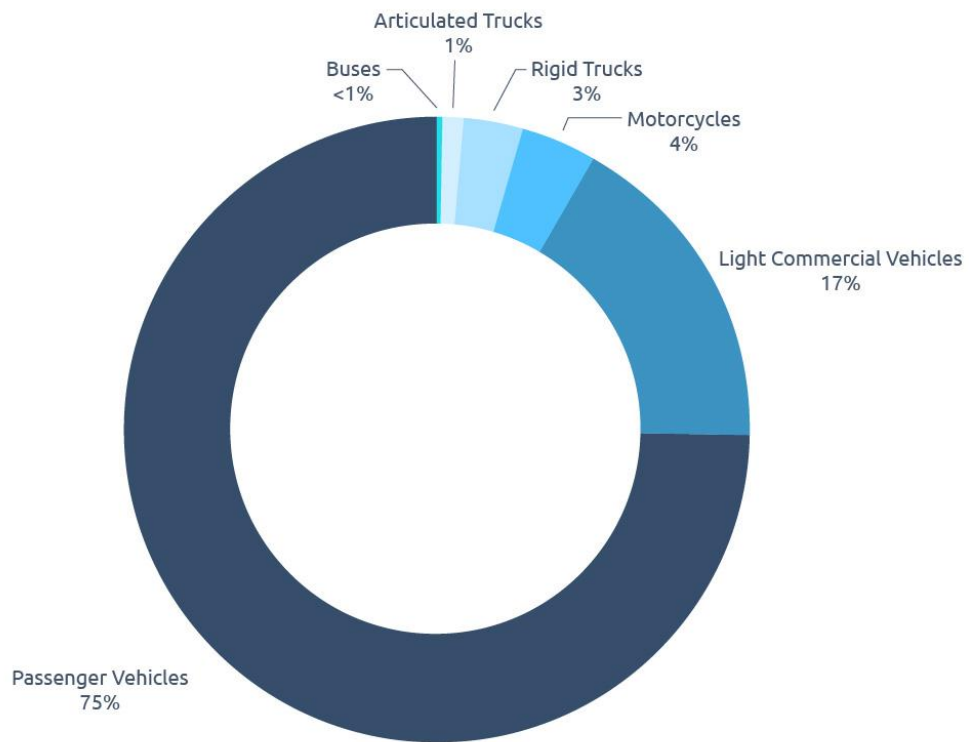
> By 2025, all urban deliveries of groceries, parcels, furniture, and other goods should be done by an electric vehicle.
>
> — Richard Savoie
> Adiona Tech

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3 https://www3.weforum.org/docs/WEF_Future_of_the_last_mile_ecosystem.pdf

4 https://tfl.gov.uk/info-for/media/press-releases/2023/march/london-s-first-cargo-bike-action-plan-launched

Number of vehicles in Australia

Articulated Trucks
1%

Buses
<1%

Rigid Trucks
3%

Motorcycles
4%

Light Commercial Vehicles
17%

Passenger Vehicles
75%

Total emissions by vehicle

Buses
2%

Articulated Trucks
15%

Rigid Trucks
3%

Motorcycles
<1%

Light Commercial Vehicles
21%

Passenger Vehicles
52%
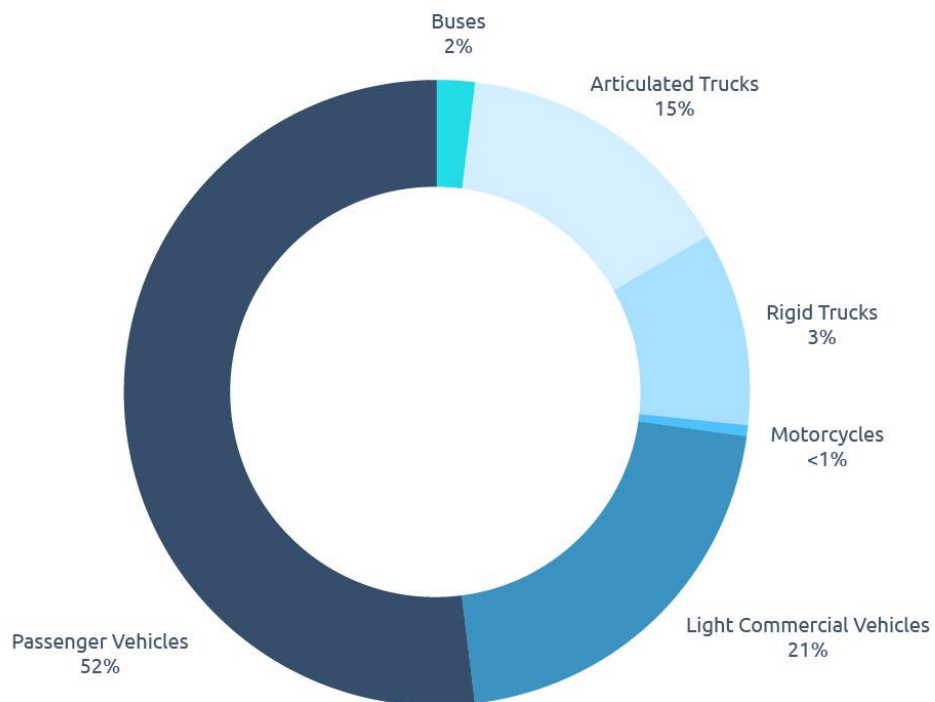
"Australia is on track to purchase 50,000 EVs in 2023, up from 33,410 in 2022. If purchased by consumers, this would reduce emissions by 142,000 tonnes of CO2. If split between rigid trucks and light commercial vehicles, it would reduce emissions by 527,500 tonnes of CO2.

"We believe that light commercial vehicles and smaller last mile delivery vehicles are a perfect target for electrification – due to their high utilisation rates, kms travelled, and frequent stops. This is the low hanging fruit that Australia should prioritise, and it will ultimately save businesses money.

"It's vital that we remove as many of these last mile delivery and fleet CO2 emissions from the road network as soon as possible and optimise these journeys to make them as efficient as possible. Companies should be simultaneously trying to increase their proportion of electric vehicles, while decreasing the number of kms they drive per delivery."

— Richard Savoie
Adiona Tech

	Passenger car	Light commercial vehicle	Rigid truck	Articulated truck
Average distance travelled per vehicle	11,100kms	15,300kms	21,100kms	78,300kms
Fuel used per 100km	11.1L	12.8L	28.6L	53.1L
Petrol / diesel split	~99/1	~50/50	~1/99	~0/100
Fuel used	1,232L	1,958L	6,034L	41,418L
CO2 produced per vehicle	2.84 tonnes	4.9 tonnes	16.2 tonnes	111 tonnes
Number of vehicles in Australia	14,726,967	3,412,459	521,255	104,442
Tonnes of CO2 emissions (total)	41,774,090	17,082,700	8,401,980	11,636.560

Regional Trends

The ABS vehicle survey provides regional data in addition to vehicle figures, which we have combined with our CO2 emission estimates. It demonstrates several important trends. Vehicles travelling in NSW, Victoria and Queensland consume by far the most fuel, and thereby produce the most CO2 emissions. NSW vehicles produce 2381 megatons of CO2 every year, compared to just 72 megatons in NT.

Megatonnes of CO2 produced by vehicles

0   2500
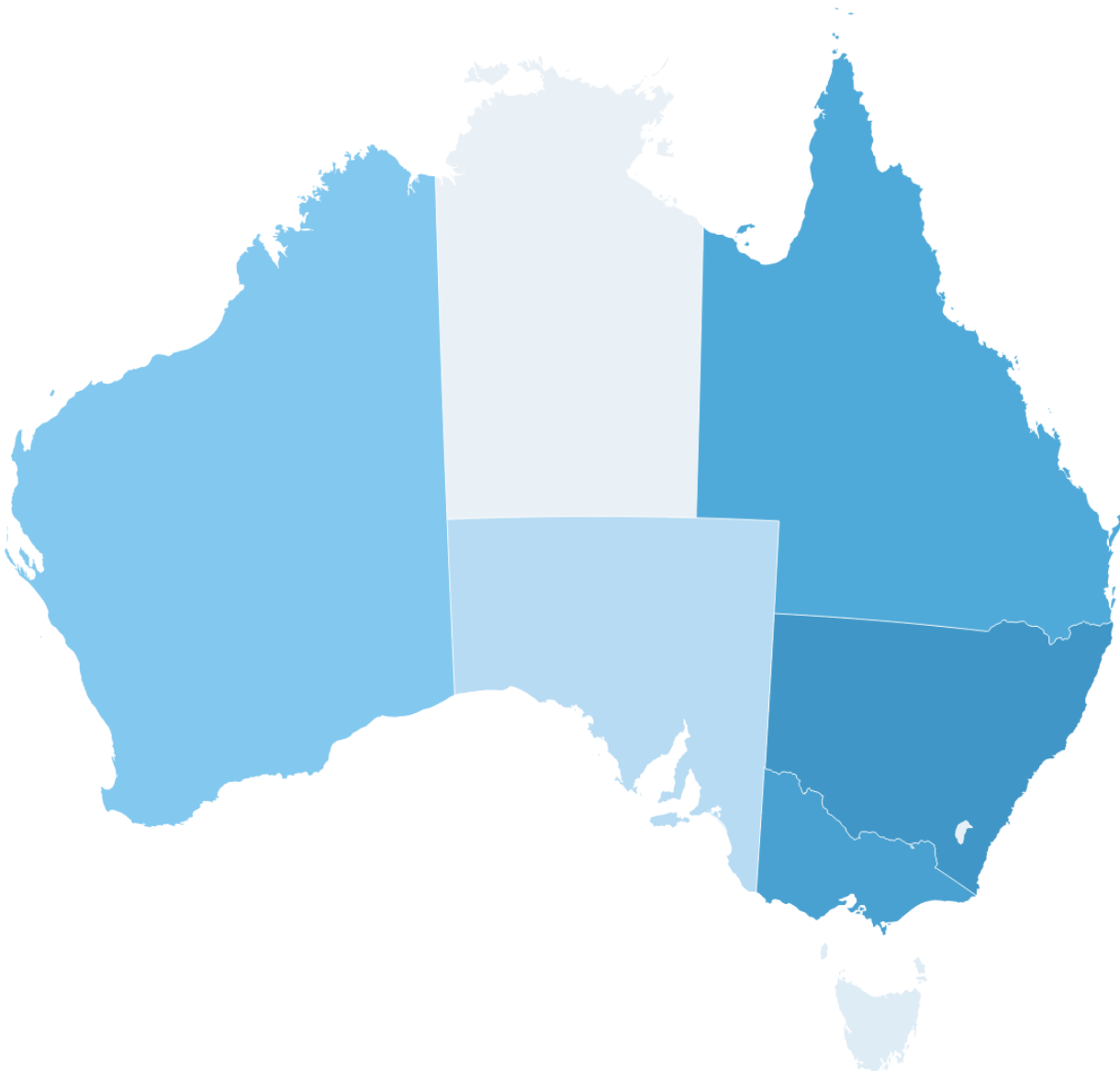
There is also a significant difference in vehicle and fuel type by region, due to population density and road types. For example, 66% of the fuel used in the Northern Territory is diesel, vs just 32% in the ACT. This is because of the 3.5 billion kms travelled in the ACT, only 122 million were freight vehicles or buses (3.4%) – which primarily use diesel. This ratio is much bigger in the Northern Territory – 207 million kms travelled by freight vehicles and buses, from a total of 2bn kms travelled by all vehicles (10%).

|	NSW	VIC	QLD	SA	WA	TAS	NT	ACT
Distance travelled (million)	69,061	63,602	50,713	16,392	27,597	5,558	2,022	3,556
Fuel (megalitres)	9,524	8,327	7,350	2,273	4,075	767	290	414
Fuel efficiency score	7.25	7.63	6.89	7.21	6.77	7.24	6.97	8.58
Diesel split	46%	50%	52%	50%	53%	51%	66%	32%
CO2 produced (megaton estimate)	2,381	2,081	1,837	568	1,018	191	72	103

The materials in our EVs

Rare materials are an essential component in electric vehicle battery manufacturing, and should be an environmental consideration when Australia attempts to prioritise its EV strategy. There is a global shortage of elements such as lithium and cobalt, which are essential for creating the kind of powerful and long-lasting batteries used in modern electronic products. Each battery requires mining, manufacture, and transport, and will produce CO_2 emissions in the process. Mining lithium from salt flats is an extremely water intensive process, and can leave toxins that negatively impact the environment. It is important that they go to vehicles that travel the most, and are parked for the least amount of time.

The composition of batteries used in light commercial vehicles and passenger vehicles are broadly comparable. The battery will typically consist of large amounts of common materials like graphite (52kg) as well as small amounts of rare materials like lithium (6kg). This means that every tonne of graphite used in the production of EVs can produce 19 batteries. For a rarer material like lithium, each tonne mined has the potential to create 200 batteries.

If these 200 batteries go into LCVs, they would help eliminate 980 tonnes of CO_2 emissions every year, compared to 568 tonnes of CO_2 emissions if they went into passenger vehicles. This is a notable gap.

Li

Lithium

1 tonne of lithium
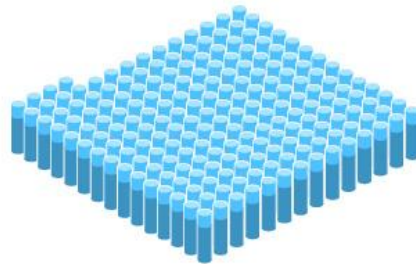
Creates 200 EV batteries

586 t

Used in passenger vehicles, these batteries could remove 586 tonnes of CO_2 emissions per year

980 t

Used in light commercial vehicles, these batteries could remove 980 tonnes of CO_2 emissions per year

Electrifying freight transport

The total freight transported by road was estimated at 223,949 million tonne-kilometres. Articulated trucks accounted for the vast majority of this weight (77.4%). However, a significant proportion was also attributed to rigid trucks and light commercial vehicles (41,820 million tonne-kilometres and 8,893 million tonne-kilometres respectively).

Victoria had the highest road freight estimate, transporting 59,284 million tonne-kilometres, followed by Queensland (52,833 million tonne-kilometres), New South Wales (51,277 million tonne-kilometres) and Western Australia (34,478 million tonne-kilometres).
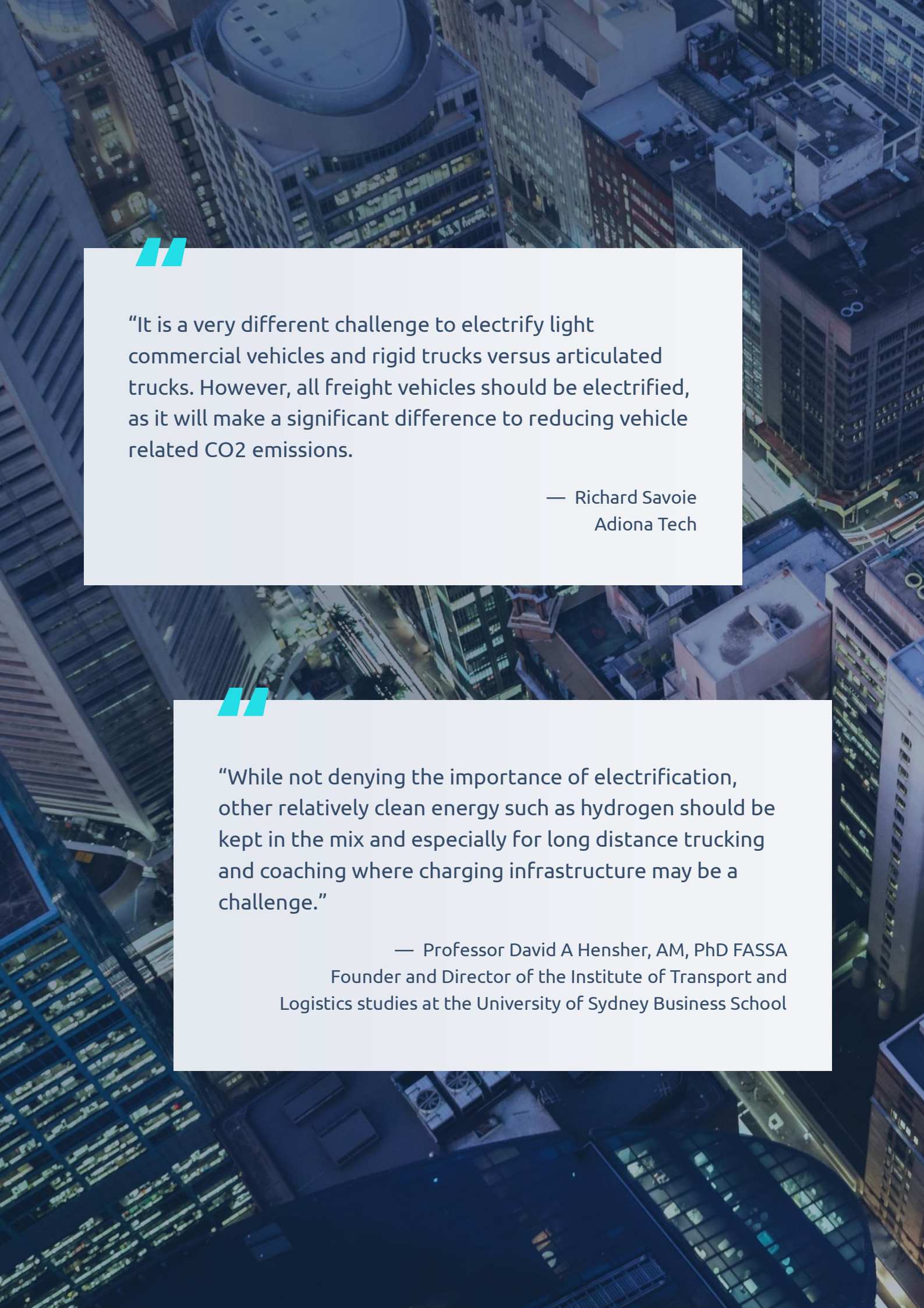
Examples of successful electrification projects assisted by the government include a $20.1M grant to Team Global Express to deploy 60 new BEV trucks in Sydney[5]. However, this is a major government investment for a huge Australian business. It's not the kind of grant that the average small or medium sized business could pursue. Furthermore, 60 BEVs represent less than 1% of the 6,500 road vehicles that TGE operates.

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[5] https://arena.gov.au/news/depot-of-the-future-delivers-australias-largest-electric-vehicle-logistics-fleet/

The ABS data also provides a breakdown of freight vehicle distance travelled based on cargo and vehicle type. Sub-industries within transportation -- for example, transportation of crude materials or tools and machinery -- are prime candidates for electrification in the short term. They account for the most kms travelled by smaller freight vehicles rather than articulated trucks. This means they will need to tackle last mile delivery electrification and optimisation more urgently. Meanwhile, other sub-industries such as transport for animal and vegetable products (oils, fats and waxes) must solve the problem of transporting their goods over longer distances, with larger freight vehicles.

Percentage of kms travelled by freight vehicles (by vehicle type)

■ Light commercial vehicles   ■ Rigid trucks   ■ Articulated trucks
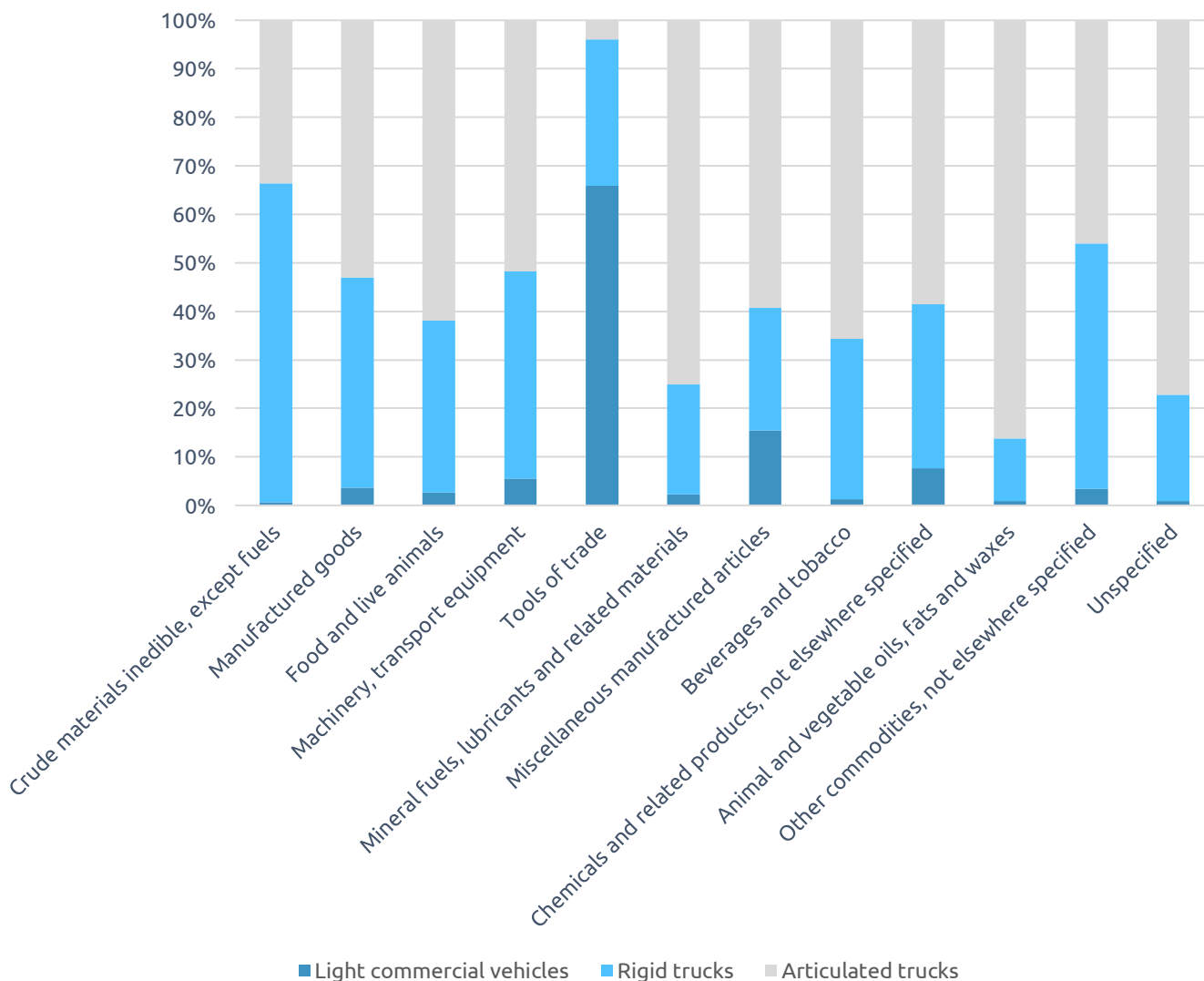
> "It is a very different challenge to electrify light commercial vehicles and rigid trucks versus articulated trucks. However, all freight vehicles should be electrified, as it will make a significant difference to reducing vehicle related CO2 emissions.

— Richard Savoie
Adiona Tech

> "While not denying the importance of electrification, other relatively clean energy such as hydrogen should be kept in the mix and especially for long distance trucking and coaching where charging infrastructure may be a challenge."

— Professor David A Hensher, AM, PhD FASSA
Founder and Director of the Institute of Transport and Logistics studies at the University of Sydney Business School

Federal incentives

At a federal level, the new National Electric Vehicle Strategy has been widely criticised as being lightweight and lacking ambition. It pales in comparison with the efforts of other developed nations, and our data suggests it has some glaring omissions.

Our data shows that electrifying delivery and freight vehicles should be a top priority for any national EV strategy, especially as more delivery vehicles are put on the road. It is therefore deeply concerning that the Australian national EV strategy appears to focus exclusively on passenger vehicles and light commercial vehicles. Larger vehicles are ignored, and the new strategy has many of the same flaws as proceeding ones – such as the $250m Future Fuels Fund and $146m Driving the Nation fund.

These incentives target the manufacture of EV batteries and building public charging infrastructure. Australia's EV infrastructure is in urgent need of investment, but it's well known that most commercial fleets can't practically share public chargers. Transport and delivery businesses are built on efficiency, and they demand predictability regarding availability times and costs for charging. Therefore they usually build their own charge networks via partnerships.

A successful national EV strategy must incentivise businesses as well as consumers, and that means listening to them about what it would take to make them switch.

Regional incentives

Currently, there is little joined up thinking between states and territories when it comes to incentivising electrification. Some are putting serious money behind policies with a potential to make a real difference, while others are not. South Australia famously proposed a new EV tax as recently as 2020.

For passenger EVs, each state has incentives that range from $3k-$3.5k rebates, discounts, or waiving of stamp duty and registration, as outlined by the NRMA. There are federal incentives to waive 5% import tax and fringe benefits taxes. Even though these rebates could include commercial vehicles, most states have a price cap of ~$70k which excludes all but the smallest electric vans and all medium/heavy-duty vehicles.

There is a big gap between two of the biggest business focused state electrification policies in Australia. NSW has a $105M EV Fleets Incentive for fleets of at least 10 vehicles, or aggregators that combine purchases via a bidding process. It offers a "Total Cost of Ownership" gap incentive of up to $3,400 per vehicle (including $400 for charging infrastructure) for light commercial vehicles up to 4.5T. Although Victoria has a similar incentive, it has only set aside a fraction of NSW's $105m. Victoria is offering $3k rebates but only up to $5M for all commercial vehicles in the state.

$3,400 per vehicle and $400 for charging infrastructure may not go far enough for some businesses. Larger enterprises with bigger fleets will make the switch and realise the cost benefits of choosing EVs, but smaller businesses may still be put off by the large initial financial outlay.

"It remains a concern that, in Australia, we have significant disparities between the States in terms of incentives, rewards and plans to establish clear policy settings that will support the required infrastructure to ensure efficient and timely charging for electric vehicles."

— Professor David A Hensher, AM, PhD FASSA
Founder and Director of the Institute of Transport and Logistics studies at the University of Sydney Business School

	NSW	VIC	ACT	SA	TAS	QLD	NT	WA
Subsidy for EV purchases	✓ $3,000	✓ $3,000	✓ $15k loan	✓ $3,000	✗	✓ $6,000	✗	✓ $3,500
Registration fee / tax discounts	✓	✓	✓	✓	✗	✓	✗	✓
Road Usage Tax	2.5c/km (2027)	2.5c/km	✗	✗	✗	✗	✗	2.5c/km (2027)
Home charger installation subsidy	✗	✗	✗	✓	✗	✗	✓	✗
Public charging infrastructure investment	✓	✓	✓	✓	✓	✓	✗	✓
Private charging infrastructure investment	✗	✗	✓	✓	✓	✓	✗	✓
EV Uptake Goal	50% by 2030	50% by 2030	100% by 2035	✗	✗	50% by 2030, 100% by 2036	✗	✗

What we want to see

We expect the introduction of low or zero emissions zones to be a major debate in the years ahead. In the biggest Australian cities like Sydney and Melbourne, restrictions on ICE vehicles are a logical and necessary step to reduce emissions, improve congestion, and ease air pollution. However, it cannot be done overnight, and local governments would need to do more to compensate businesses.

For example, a small delivery business with five ICE vans would need to be fully compensated to switch to EVs, with a far bigger sum than just $3,400 per vehicle. One possible solution would be to allow businesses to "bank" their fines and congestion charges for driving ICE vehicles in zero emissions zones, giving this money back on the condition it goes towards an EV.

We need drastic intervention from the government to make electrification more appealing to businesses, deploying both the carrot and the stick. Federal and state leaders must prioritise urban spaces and last-mile delivery, combining financial incentives with emission caps. An emissions limit on new commercial cars sold that would decline to 0 by 2035 would effectively give businesses 12 years to phase out all petrol vehicles.

Currently, there is little consensus on a state level, and that needs to change fast. It's farcical that New South Wales has earmarked $105M for fleet electrification, while Victoria has only allocated $5M. Others are yet to implement schemes for fleet electrification schemes at all.

Get in touch

Backed by KPMG and Telstra, Adiona Tech is a Sydney based logistics software startup. It powers millions of efficient product deliveries for some of the world's biggest brands – such as Coca-Cola Europacific Partners.

Adiona's AI-powered delivery route planning and optimisation engine applies machine learning to real traffic data to lower delivery costs, reduce vehicles emissions and help businesses get to Net Zero faster. For delivery companies switching to EVs, its fleet simulator enables customers to optimise their fleet purchase, deployment, and infrastructure plans.

> "Adiona reduced our delivery planning time by 78%, improved our customer service levels to 99.52% on-time and in-full delivery, and have helped us achieve 653% growth and rank 11th in the Deloitte Fast 50."
>
> — Jordan Muir, Co-CEO
> Home Delivery Service

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