

The Future of
Australian Logistics
and our Cities

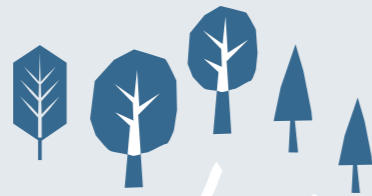


Contents

ACKNOWLEDGEMENT OF COUNTRY

Arup acknowledges the Traditional Owners of the land where our offices are located.

We pay our respects to Elders past, present, and emerging, and to all Aboriginal peoples and Torres Strait Islanders. We recognise and celebrate their cultures, traditions and protocols.



What does the future of logistics look like in Australian cities and regions?

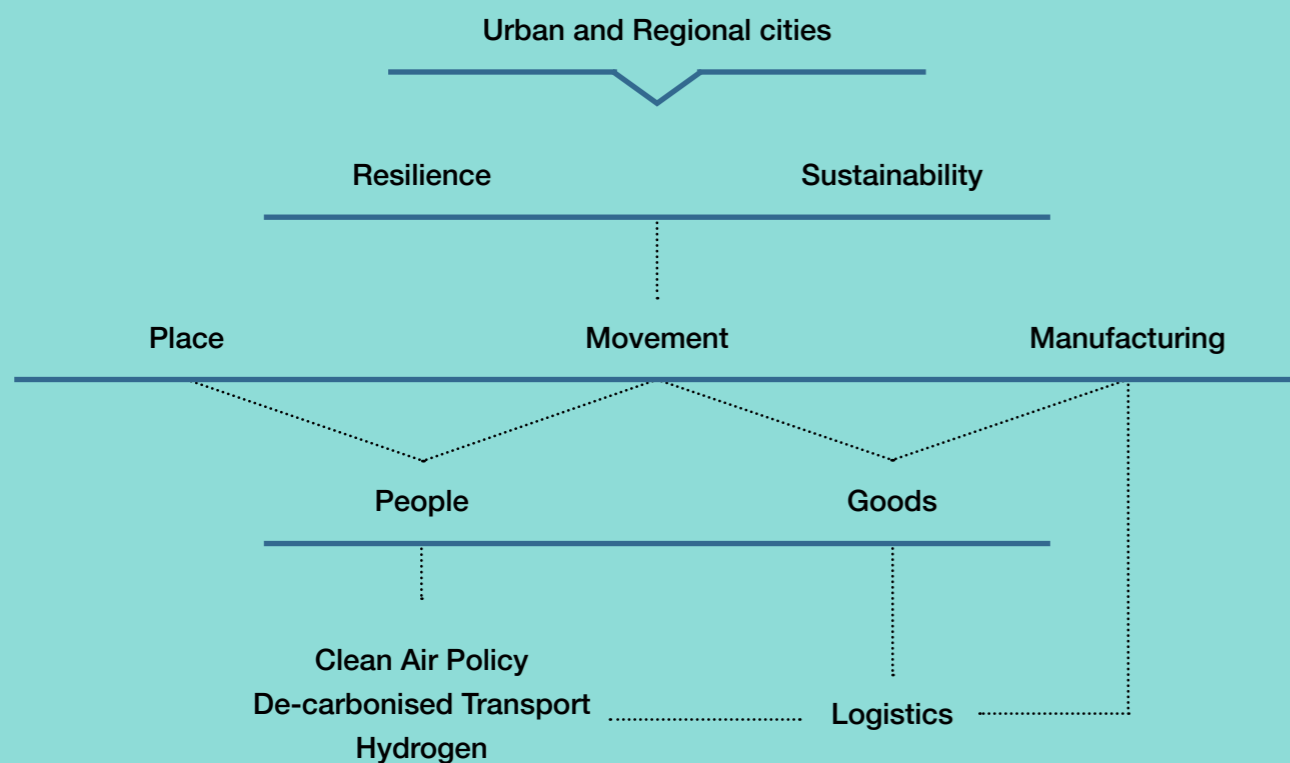


Figure 1: Supply and demand chain

Executive summary

As we rapidly adapted to new ways of living and working during the pandemic, so too did our cities. The need to move people at speed to the city lessened, while the swift delivery of goods, services and data to homes rose and began to play a crucial role in the health of our economy.

This increase in goods movement highlighted Australia's supply chain sensitivity to shocks and demonstrated that there is little resilience built in for changing scenarios and operational needs. Nonetheless, the current climate has also provided a fundamental opportunity to assess the relationship between logistics, our cities and how we ensure a sustainable future for generations to come.

Moving towards a new normal, it is pivotal to look at logistics and movement of goods across our cities, both urban and regional, to establish desired future outcomes for social, economic, environmental and political benefits.

Logistics in our cities now, and into the future, will require numerous levels of resilience and integral sustainable mechanisms to balance closed supply chain loops with global markets and local needs.

Arup has an inherent core drive to shape a better world and create sustainable and resilient futures for all in our cities. We are guided by six key sustainability principles in designing and reimagining our future cities which we discuss through this report. These include:

- Improve human health and wellbeing;
- Transition to a zero-carbon economy;
- Adopt circular economy principles;
- Enhance community resilience;
- Create social value; and
- Respect planetary boundaries.

This report explores how we can look at the future of Australian logistics in line with our changing cities and local environments for the benefits of consumers, businesses, communities, local economies and wider industries.

An impact-driven approach was adopted in this research which looks first at the overarching impact and outcomes sought from change and then works backwards to determine the actions which can enable those impacts and desired outcomes.

Through this approach, an outcomes framework has been developed to guide the industry actions necessary to build a resilient and sustainable future for our people, cities, towns and regional areas.

Using a series of interventions focused on precincts and corridors, movement and place, new business models and new technology will help drive a positive and thriving future for Australian logistics. Clear supporting policy goals, strategy and action are also necessary for the success of these interventions.

The solutions to the challenges faced by the logistics industry also have the potential to bring benefits to urban and regional areas, aligned with the United Nations' Sustainable Development Goals (SDGs) to assist individuals, businesses, cities and governments navigate towards 2030 and beyond.

The future of our cities and towns will be shaped by supply and demand services – now is our opportunity to embed sustainability and resilience to get this right for future generations.

The Australian logistics and freight transportation industry is integral to the future economic success of the country.

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The logistics industry has seen rapid shifts in supply and demand chain trends, both leading up to COVID-19, and in the current move to a ‘new normal’.

For the purpose of this report, logistics and the logistics industry are defined as the full supply chain for rail, road, sea and air freight, including first and last leg servicing and delivery.

Like all other industries, the logistics industry faces complex challenges with the evolving nature of how we live, work and operate in today’s world.

This multidisciplinary study on the future of the Australian logistics industry, undertaken by Arup for discussion with the Australian Logistics Council, looks at key drivers and trends in our local cities. It explores areas where the Australian logistics industry can directly benefit our cities and towns through considered decision making and change.

By presenting an actionable framework for achieving sustainability and resilience in the Australian logistics industry, this report shows how logistics can become a broader catalyst for social, economic and environmental benefits in Australian cities and regional areas.

30%

domestic freight by road (2016)¹

\$53bn

estimated cost of congestion per year by 2031²

43%

CO₂ emissions for the total of Australian transport from pickup trucks, vans, heavy trucks and rail³

\$100.75bn

revenue for industry 2019-2020⁴

546k

Australians in workforce sector for Logistics⁵

Australian Logistics Industry

The transport, postal and warehousing industry employs 665,000 people⁶ across Australia, including full time, part time and independent contractors. This industry is facing several social, cultural, political, technological, environmental and economic challenges which affect both the way the industry operates as well as the future outcomes for the industry, consumers and our cities.

For example, changes in behavioural patterns, localisation, surges of new technologies and innovations are all factors to be considered when looking at where the future of Australian logistics could go. These factors affect all stakeholders on the supply and demand chain from producers, consumers, neighbourhoods, logistics businesses, employees, local cities and global networks.

As a large island nation, Australia propagates supply and demand chains which are reliant on a combination of freight export and delivery by sea, air and land. Consequently, the country has always faced the challenge of moving goods and freight in and out locally, regionally, nationally and internationally in efficient, safe and cost-effective ways.

In recent years all industries have been under growing pressure to move towards sustainable operating practices, whether this be consumer-driven or regulatory-led. Environmental impact is a concern and there is pressure for the industry to comply with logistics regulations, reduce the amount of greenhouse gas emissions and air pollutants and manage this across the supply and demand chains. Sustainable business practices are increasingly in demand and businesses are needing to demonstrate transparency in order to maintain a social license to operate.

Introduction

Australian Logistics and COVID-19

COVID-19 has stress-tested many aspects of how we live, work and operate in our cities. What the pandemic uncovered was the aptitude with which business and industry could implement major changes to keep operating. Yet, with climate predictions heralding more varied weather events and other unforetold shocks, it's critical we examine the COVID-19 experience and the key trends and impacts. This will help uncover opportunities to embed resilient systems into the logistics industry for a successful future.

Digital and e-commerce

Spending trends shifted dramatically in response to the pandemic and its broader implications, changing what consumers are buying and how they buy it. While there was an initial halt in spending on high-end products, the e-commerce trend has increased with more Australians purchasing products online from local and international sources.

While Australians are spending less on eating out and travel than they had been previously, there has been an increased demand for home-based products and services, delivered safely and efficiently.

Online retail is booming, and goods are not only being transported around the country to people's doors, but also exported and imported, at a faster rate than ever before. At the same time, many local retail stores are facing difficulties returning to the same levels of business and service experienced pre-pandemic.

Manufacturing, transport and movement

The future of the logistics industry in Australia is intrinsically linked to the future of manufacturing, transport services and movement of people. While the economic recovery plan is still being developed, there is a push to create a more resilient, self-reliant nation with an increase in focus on positive change to our manufacturing and service offerings – what we produce here and what we offer out to market. This will impact what we import and export as well as the overall goods and freight movement in Australia.

We are currently seeing the evolution of many existing transport services, such as aviation and public transport. Both of these industries are looking at how they can use existing infrastructure or create new infrastructure to support new and emerging trends and ways of operation.

The future of logistics in Australia will be linked to these other industries as they pivot models into a 'new normal'. Through this transformation, there are opportunities to create significant positive change in how we move goods and freight.

While our changing environment highlights the need for critical action, it is imperative that we look at how to move goods and freight sustainably while also ensuring resilience is built into our systems to support the supply and demand needs for economic success.

This transformation to a 'new normal' highlights the need to both create more accountability in the industry and to examine physical, social and digital infrastructure to support these changes. This includes new technology, business models, regulations, health and safety and connection with the cities and consumers.



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Opportunities and skills

While Australia has fortunately fared relatively better than many other countries in terms of COVID-19 impacts, there still remain opportunities for the freight and logistics industry and its organisations to shift business models and services to focus on skills and ensure the industry is properly equipped for a post-COVID future.

Due to increasing utilisation of automation and digital technology, warehouse jobs are changing and requiring new forms of training. Safety for communities, employees and employers alike should be one of the key focuses of the transformation both during COVID and post-COVID. Where companies are already required to upskill and train workers to meet regulatory requirements for health and safety, this is an opportune time to upskill and train in new sustainable business practises, business models and new technologies.

This report highlights the major factors affecting the future of our cities and towns and addresses ways that the logistics and freight industry in Australia can transform with the city.

It explores opportunities to increase resilience and create sustainable futures for all through the considered relationship of logistics to our cities, towns and regions.

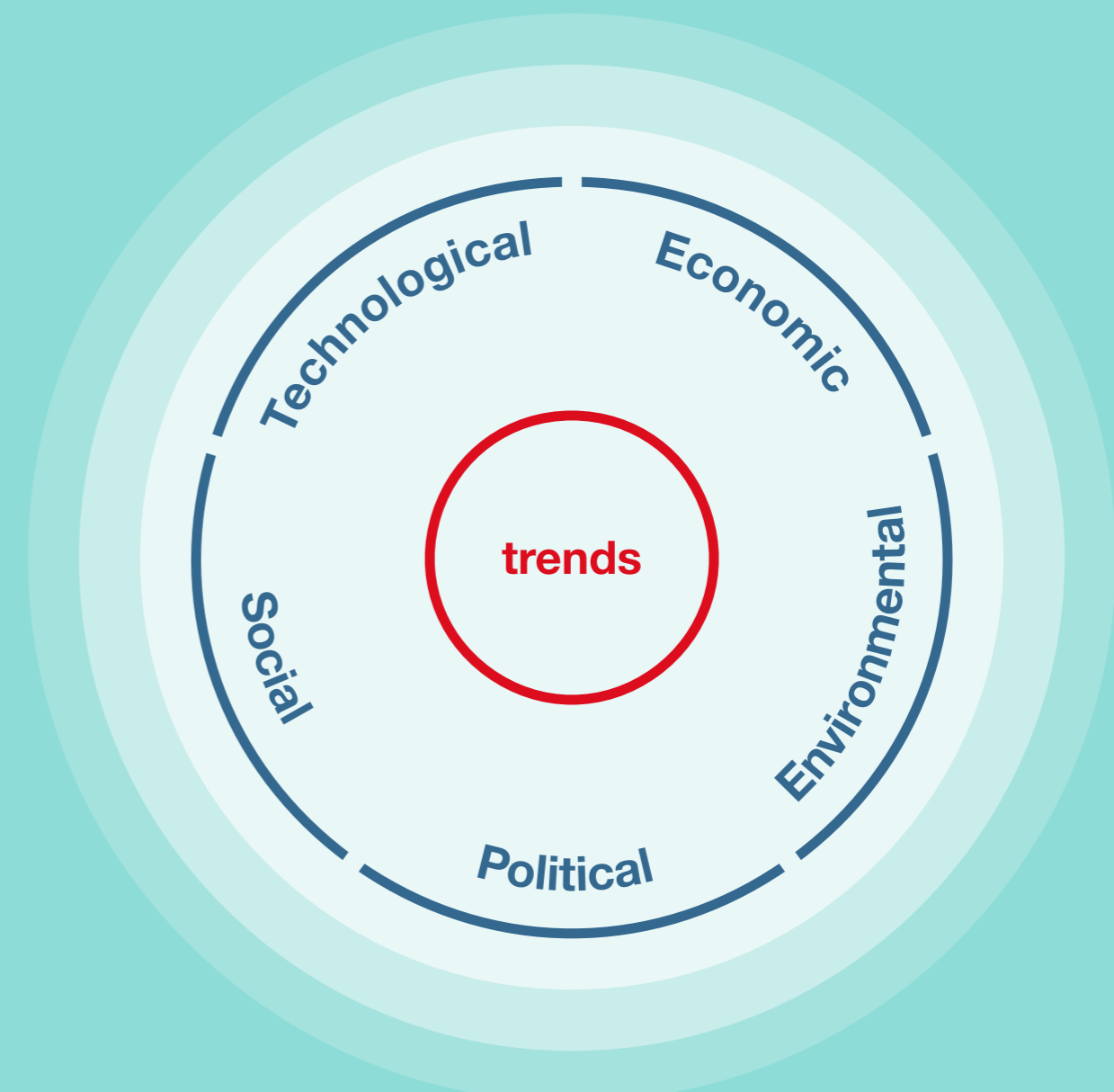
COVID-19 has shown a need to focus on creating and embedding resilient systems in our businesses and industries to be able to handle shocks and manage varied scenarios.

Our cities and regions have been evolving for decades, driven by economic, social, cultural, political, technological and environmental advancements.

Recently with COVID-19, we've seen major adjustments to working, living and operating trends while we adapt to a 'new normal'. What we've seen is that not all these trends and drivers are new, but rather most have been exacerbated and accelerated due to a global pandemic.

These new complexities to our systems, added to existing trends, are changing some of the outcomes we want to see in our cities, towns and regional areas.

So, what exactly is driving our changing city environment?





Social trends

Local resurgence / localism

Geographic locations and patterns

Social cohesion and equality

Increase in personal car use

Decrease in public transport use

Increase in active transport

Tactical urbanism

Digital lifestyle

E-commerce

Sustainable behaviours

Public health

Micro mobility

Pre-pandemic, there was growing momentum around achieving liveable, healthy, safe and attractive communities ‘for all’. Now, these attributes of an ideal community have become even more important as people stay closer to home and consider where to live in the context of changed work and home environments.

The ‘local’ resurgence and ‘15-minute-villages’

Pre-pandemic, the ideal city was one where the opportunities to engage in work, recreation and commerce were all within 30 minutes of our front doors and where a significant number of people travelled in two short daily peaks. These ‘30-minute-cities’ are being disrupted by the growing trend of people living and working in something more akin to a ‘15-minute-village’.

Global working surveys currently suggest that, post-pandemic, roughly 40% of people wish to work from home 40% of the time. Our own surveys⁷ support this finding. If those preferences lead to a real redistribution of work (and many major employers in technology and professional services around the world have already announced a pivot to home working), that will in turn lead to more local service and retail jobs in the communities where people actually live. On this basis, the 15-minute-village is likely to boom.

COVID-19 also saw an increasing trend in people moving ‘out of the city’ to regional towns.⁸ While working from home is more accessible and affordable, Australians are looking for areas where they can access all their services locally but in a more diverse and affordable setting. This fundamental reshaping and decentralising of the economy and urban landscape essentially winds back the clock to when high streets were the place to be and local businesses all had a shopfront. In the digital lifestyle, many services which people sought outside their 15-minute zone are now digitally delivered to their front door and just in time.⁹

With an increasing need for social experiences and in order to avoid isolation and social exclusion, the concentration of services, employment and social opportunities in cities and towns across these 15-minute-villages enable the exploration of local offerings and help reduce social inequalities.

An ageing population and chronic diseases are also pushing healthcare delivery at home, resulting in more home deliveries and assessment of models for easier access to healthcare. Access to diverse services through well-designed and implemented social, physical and digital infrastructure is fundamental to help this social cohesion and reduce inequality.

While we saw a rapid decrease in the use of public transport in the wake of COVID-19, there has been a trending increase in active transport in this new localised suburbia, supported by tactical urbanism, pop up pedestrian areas and bike lanes.

We have seen an increased value in walking as an agile mode of transport around neighbourhoods – one which can emphasise the idea of a multisensory, interactive and social experience while doing so at a physical distance from others. This trend in active transport is associated with not only an emphasised value in physical activity but also physical and mental health and wellbeing.

The decrease in public transport use is linked to new working from home arrangements where people don’t need to commute as far or as much, as well as physical distancing measures and public health concerns.

However, there has also been a concurrent rise in personal car usage, caused by public health concerns in shared spaces and the inability of public transport networks to get people to their local services.

Both the increase in active transport and personal car usage has highlighted the importance of local amenity and equal services where people live, work and operate, regardless of location.

Not only does increased congestion on roads lead to more road injuries, the increases in delivery vehicles and personal cars also present a hazard for drivers, pedestrians, cyclists and public transport users alike. Heightened congestion also produces poorer air and noise quality, impacting the footfall in retail areas.

Although road-related deaths in Australia have declined over the past decade, the rate of injuries has increased with a steady annual growth rate of approximately 3.6% since 2016.¹⁰

COVID-19 has also accelerated the trend for online shopping while challenging the concept of retail stores in a post-pandemic world. Consumers are expecting faster delivery times for their products, prioritising cheaper and sustainable delivery methods with same day or instant delivery expected to grow by 20-25%.¹¹ By the end of 2020, the world will send more than 100 billion packages.

↑ 43%

Volume change for Australia Post domestic parcels (Nov 2020) from same time previous year¹²

There has also been an increase in the number of options for customers to collect or receive their goods, including Click and Collect, where customers order online before collecting their goods from the store or a local collection point (e.g. Woolworths or Big W). Deliveries are being fulfilled in a variety of ways (combinations of light goods vehicles, electric vehicles and cycle couriers) and are affecting the customer-facing transportation and logistics market.

Although e-commerce brings benefits to customers, who have more choice than ever before, businesses (retailers, carriers, software providers and local authorities) must fulfil increasingly complex and competitive delivery commitments while controlling costs and providing a quality customer experience.

As online shopping increases, so too does the tension between next-day or sooner Amazon-style deliveries of goods to our doors.

864m

Parcels shipped in Australia in 2018¹³

This brings an inherent inefficiency to our systems where retailers offer these services regardless of how many extra vehicles it puts on the road. Many of these vehicles are part-loaded or work on sub-optimal routes in order to meet time-pressure, as opposed to efficiency pressure. This in turn significantly contributes to road congestion. The cost of these expedited forms of delivery manifest as either premium delivery fees borne by the customer or worsened congestion or air quality, the payer of which, be it the operator, retailer or consumer, is less obvious.

At the same time, consumers are also becoming more socially conscious and seeking transparency in the supply chains of their products – everything from where the product was made to how it was transported. The huge growth in e-commerce and the strain of the last mile means that customers, retailers and supply chains require solutions that support the sustainable and transparent, as well as reliable and time-sensitive, delivery of goods.

Consumers are leading increasingly digital lifestyles. These changes in consumer behaviour pose different opportunities for logistics companies to meet changing supply and demand needs and provide safe and efficient services in the 15-minute-villages and 30-minute-cities. Based on these trends, the future of Australian logistics should look to support the 15-minute-village with more regional working, digital lifestyles, active transport and public health, safety and wellbeing.



Drivers of change Technological



Technological trends

- Automation
- Blockchain
- Internet of things
- Gamification
- Connected
- Micro consolidation
- Autonomous vehicles
- Communication and sharing
- Constant connectivity
- Digital information
- Big data
- Booking systems
- Freight operator recognition systems

The technology we have today enables interaction, personalisation and collection of data across working, living and operating activities.

Intelligent systems already allow transport modes to communicate with each other and with the wider environment, paving the way for truly integrated transport and logistics solutions and experiences for both public and private services.

Already, journey planners facilitate journey selection and automation are streamlining service offerings and operational processes across the industry. New technologies and the Internet of Things (IoT) are allowing the physical city to change and connect with sensors, all aided by cloud computing becoming more affordable and widely available. This unlocks opportunity for cities to become smarter and more interactive.

A study conducted by PwC¹⁴ on industrial mobility found that the top trigger for manufacturers in America to adopt industrial mobility technologies (i.e. from mobile robots to autonomous trucks) is cost advantage (86%) followed by customer/supply expectations (47%) and

increased safety (38%). Nearly 60% of manufacturers cite cost as one of the top barriers of adoption of semi-autonomous and autonomous vehicles within their plants, followed by immature technology (42%), safety issues (32%) and lack of talent (32%).

Drones are becoming a quick and cheap method of delivery for small parcels and have been vigorously tested to become a viable delivery method. They reduce congestion and emissions on the roads while being one of the fastest forms of delivery for a single item. Similar to helicopters, drones can be used for short distance travel or delivery, reducing foot traffic on the ground but creating large amounts of visual and physical disruption.

The biggest barrier which drones face is social acceptance, and their questionable energy efficiency also makes their environmental impact quite significant. However, drones do have the potential to deliver up to 80% of parcels in the next 10 years.¹⁵ At a larger scale to

drones, Hybrid-electric Vertical Take-off & Landing (eVTOLs) are producing viable results.

Platooning is an example of autonomous vehicles technology where two or more trucks are linked in convoy using Vehicle 2 Vehicle (V2V) technology, where the vehicle leading the platoon will share data and inform the direction of the following trucks to synchronise movements.

The technology is being developed to require only a single driver in the front vehicle while the other autonomous trucks follow with small gaps between vehicles. This arrangement reduces the space occupied by the fleet on the road network and increases efficiency of delivery and petrol usage by taking advantage of speed harmonisation and wind breaks.

While platooning would significantly reduce the space which delivery vehicles take up on the roads, it also has various negative impacts that are similarly associated with autonomous vehicles.

Not only is a cultural shift required for drivers to trust driverless vehicles, it is also by no means guaranteed that the benefits of platooning on interstate corridors can translate effectively into urban and suburban environments before complete road automation – which may be some way off.

Autonomous parcel locker solutions, also trending, involve vehicles carrying multiple lockers which deliver to central locations for multiple consumer pickups. Akin to agile consolidation centres, these moving lockers give opportunities for customers to arrange pick up locations that best suit them, while reducing the number of vehicles used to deliver to customers doorsteps.



The IoT is allowing the city to monitor and analyse activity levels while being able to change every element of the supply chain in the logistics industry, from enhanced asset tracking to warehousing operations and freight transportation. Other automated technologies are also allowing monitoring and analysis of vehicle emissions, fuel efficiency, energy consumption and business operations.

Blockchain and other distributed ledger technologies are facilitating secure and transparent solutions for multiple party tracking, coordination and automated record keeping of assets and products.¹⁶

Moreover, new forms of autonomous mobility are on the rise and in the near future they will change both the way we travel and demand for road infrastructure. Cycle-logistics for example utilises cyclists to fulfill the last mile for parcel and office deliveries. This is a carbon-friendly delivery platform that can be used in conjunction with mobile consolidation or direct injection to provide fast deliveries in peak periods.

Using cyclists to deliver small parcel in built-up areas helps reduce congestion and emissions by taking traffic off the road. At the same time, an increased number of cyclists necessitates more thorough consideration of safety measures.

Technology is enabling multi-platform logistics operations that allow a person to buy items online and have them delivered to the front door, in a shop or a collection point and this is seen to be happening across supply chains. The main benefit of this technology is the facilitation of mixed platforms, such as warehouses and vehicles, to maximise efficiencies.

Based on these digital and technological transformation trends, the future of Australian logistics should look for opportunities to advance alongside, through evolved business practices, industry connection, policy and regulation.

45%

savings in operating costs estimated from fully autonomous delivery systems¹⁷



Drivers of change Economic



Economic trends

Urban and local regeneration

Digital economy

Sharing economy

Health costs

Recession

Unemployment

If businesses and their consumers have changed how they work, live, and operate, so too must the investors and services that underpin the functioning of our cities.

National and regional governments are showing support for urban policies and regenerations that aim to boost economic recovery, increase localisation and value accessibility, as tools to foster local economy and create job opportunities. This has been seen in conversations around local manufacturing, self-reliance and export supply. Investing in local can be a catalyst for regeneration; it can help to strengthen urban areas and local economies, create jobs for more workers and provide access to diverse services for more people.

Service providers must consider their economic structure and models to support more localised needs. This may mean providing more services to more regional areas where people are now living and working from home.

The economic impact of COVID-19 is yet to be fully realised in Australia.¹⁸ It is predicted that it will take years to come out of the recession we are facing, and the health costs of this pandemic are yet to be fully realised. As the global economy evolves during and after COVID-19, it will also impact the way people live and make money, as well as how people spend it.

With unstable economic circumstances, consumers and businesses are changing the nature of their spending. With unemployment rates still high, there is opportunity for businesses to look at their models and current skills and services and examine how they can hire people in different roles with varied skills to support the shift into a 'new normal'.

What we saw before COVID-19 was the change in traditional models of service, with platform based, peer-to-peer and sharing services disrupting traditional service industries in cities around the world. A rapid shift from product to service-based business models has seen several forms of transport evolve into urban on-demand systems, such as bike-hire, loading bay rental systems, lane rental schemes and car-sharing schemes. This trend continues to evolve and change economic opportunities for our cities, local areas and businesses.

A report published by Infrastructure Australia estimated that in 2016, road congestion cost the Australian economy approximately \$19 billion, and suggests that this figure will double by 2031 if no feasible solutions are implemented.¹⁹

8.6%

of GDP from Australian logistics industry²⁰

The logistics industry has a role to play in reducing congestion through innovative and sustainable supply services.

Consolidation of deliveries is seen in some systems to reduce the number of vehicles on the road and reduce congestion. In line with the United Nations' Sustainable Development Goals (UN SDGs), addressing this issue will strongly promote economic growth within Australia.

Based on these trends, the future of Australian logistics should consider how it can support boosting the local economy while also adapting to the changing behaviours in supply and demand from consumers and businesses. E-commerce is enabling small independent businesses to access a wide range of clients; the logistics industry can play a significant role in supporting and providing the infrastructure to support and deliver for them.



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Drivers of change
Environmental



Environmental trends

- Air pollution
- Climate change
- Noise
- Decarbonisation
- Energy consumption
- Heat island effect
- Land use patterns
- Loss of biodiversity
- Green infrastructure
- Transport safety

Concern for the environment is an evident and critical driver for how our cities are evolving.

From climate change to air and noise pollution, loss of biodiversity to heat island effects, the Australian logistics industry can play a key role in addressing local and global environmental concerns. The industry can do this through various operational and policy measures across the supply and demand chains and integrating them with our cities.

In line with the United Nations' Sustainable Development Goals (UN SDGs), there is a drive for businesses and governments to improve the air quality in cities.

A large contributor of vehicle flows are delivery vehicles, consisting mostly of trucks, that ultimately increase the levels of both air and noise pollution within the city. The transport sector is one of the largest sources of Australia's greenhouse gas pollution, second to electricity. This pollution level is also growing at an alarming rate, with projections of a further 12% increase by 2030.²¹

Active transportation is a trend which looks to improve air quality, reduce noise, reduce energy consumption and improve transport safety. Several cities across Australia are already experiencing the wide range of benefits of creating places for walking, active and safe transport and increasing green infrastructure. By shifting the focus from cars and trucks to people, urban and transport planning and trains and maritime can mitigate impacts and foster sustainable economic development and environments.

In an aim to reduce congestion, parking and pollution, cities and local communities are striving for solutions which promote activity, nature and vibrancy. While an increase in active transport is great for the environment, a consideration for safety must also be integrated into how we create transport solutions between pedestrians, cyclists, cars, trucks and public transport.



18%
of Australia's total emissions from transport.²²

57%
increase in transport emissions on 1990 levels.²²

The logistics industry plays a key role in enabling these safe and liveable cities through transportation of goods, delivery models and connection with other services. Consolidation of deliveries is one global trend which aims to reduce the number of vehicles on the road engaged in last mile deliveries. Consolidation can occur at a micro and macro level.

Sustainability has evolved from a buzzword to a necessary and integral part of the logistics industry and its customers' business operations. Increasing numbers of customers are now demanding energy and waste-efficient supply chains from their logistics providers.

One key issue with e-commerce is waste. The logistics industry needs to better assess its impact on the chain and innovate more. There is an increasing trend across industries to examine alternative fuels for transportation (including biogas, bioethanol, biomethane, biodiesel) and a consideration of where hybrid electric could be used for operations across the supply chains.

Adaptive reuse and repurposing of structures and space create value for local areas and businesses without compromising further land areas. There are global examples of repurposing inner city sites to create common user consolidation centres for this purpose, using micro-consolidation on local streets and renting loading bays to reduce fines. Looking at optimisation of land use and decarbonisation in our local areas can also help create more sustainable cities and towns.

So what does this mean for logistics in Australia? In our cities and towns, mitigation measures to address climate change, improve air quality, reduce noise emissions and lower energy consumption are critical in creating more sustainable and resilient environmental futures for all. The industry can look at how it plays a part in supporting local active transport, reducing energy consumption, improving air quality and addressing climate change through adaptive reuse, movement solutions, business models, new technology and policy change that supports the environment.

Between **1990-2016**
emissions from heavy trucks have more than doubled and are expected to grow faster than any other transport emissions.²²

Domestic air travel made up **9%**
of Australian transport emissions pre 2020.²²

Drivers of change
Political



Political trends

- Global competitiveness
- Local competitiveness
- Economic recovery
- Resilient futures
- Leadership
- Policy integration
- Green politics
- Collective consciousness

Climate change, energy shocks, economic crises and political upheavals continue to foster public dissent and political activism.

There is a pressing need for cities to build self-reliance and resilience in order to prepare for, respond to and recover from crises.

COVID-19 has seen a shift and disruption in the global competitive stage; cities are now driven to demonstrate their leadership, especially in terms of environmental policies, innovation and economic recovery. Strong leadership provides visibility, legitimacy and decision-making power to city governance. The economic, social, cultural and environmental outlook for Australia is an increasingly political agenda as we look to move into a 'new normal', post-pandemic.

People are fighting for reduced congestion and pollution and striving for safer, healthier, more vibrant communities where there is equal social access to amenities and diverse services. Active policy driving and considered integration strategies are critical to create these safe, liveable places for people, to get people onto the streets in their local 15-minute-village or 30-minute-city and to enable local economic recovery.

Political leadership and global health strategies are also affecting the way we travel, with border controls (both nationally and internationally) impacting transportation of people and goods. These changes in the local and global transport systems impact the future of logistics in Australia across road, rail, sea and air.

While we rapidly transition to a more digitally-driven society, social media is opening up new possibilities for public engagement and participation. From crowdsourced initiatives to forms of self-determination and insurgency, people around the world are becoming more active in engaging with their cities and local decision-making, striving for more inclusive and transparent processes.

Active mobility, liveability, safety and connectivity top the list of priorities for many, and companies, developers, land owners and governments are being held more accountable for actions which impact our cities' social, economic and environmental future.

With these changing political landscapes, both locally and globally, the future of Australian logistics will need to consider how supply and demand chains will be impacted. At the same time, the logistics industry must remain transparent in its decision-making and demonstrate accountability for social, economic and environmental impacts on our cities, towns and regions.



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There are numerous trends impacting how we live, work and operate in our cities and towns. How can the Australian logistics industry account for these trends and drivers in planning for the future?



The future of Australian logistics should aim to enable a sustainable and resilient future for all through operations and connections across the entire supply and demand chains.

Considering the social, economic, political, technological and environmental trends our cities face, the following guiding principles are recommended to be adopted by the Australian Logistics industry in its decision making:

- Improve health, safety and wellbeing for all
- Transition to a zero-carbon economy
- Adopt circular economy principles across operations and the supply and demand chains
- Enhance community resilience
- Create social value
- Respect planetary boundaries

Reaching a more sustainable and resilient future requires action by the industry now.

The 'outcomes and actions' in the next section of this report outline an impact-driven framework that can guide the industry to reach these goals.

Pre COVID-19

56%

growth of road freight volumes projected between 2018-2040²³

16.4%

growth of rail freight volumes projected between 2018-2040²³

17%

growth of air freight volumes projected between 2018-2040²³

Australia's per capita transport emissions are

45%

higher than the OECD average²⁴.

157

people died in crashes involving heavy trucks within the 12 months prior to the end of June 2020.

These included **95 deaths** involving articulated trucks and **64 deaths** in crashes involving heavy rigid trucks²⁵.

500

heavy truck occupants are hospitalised from road crashes each year.

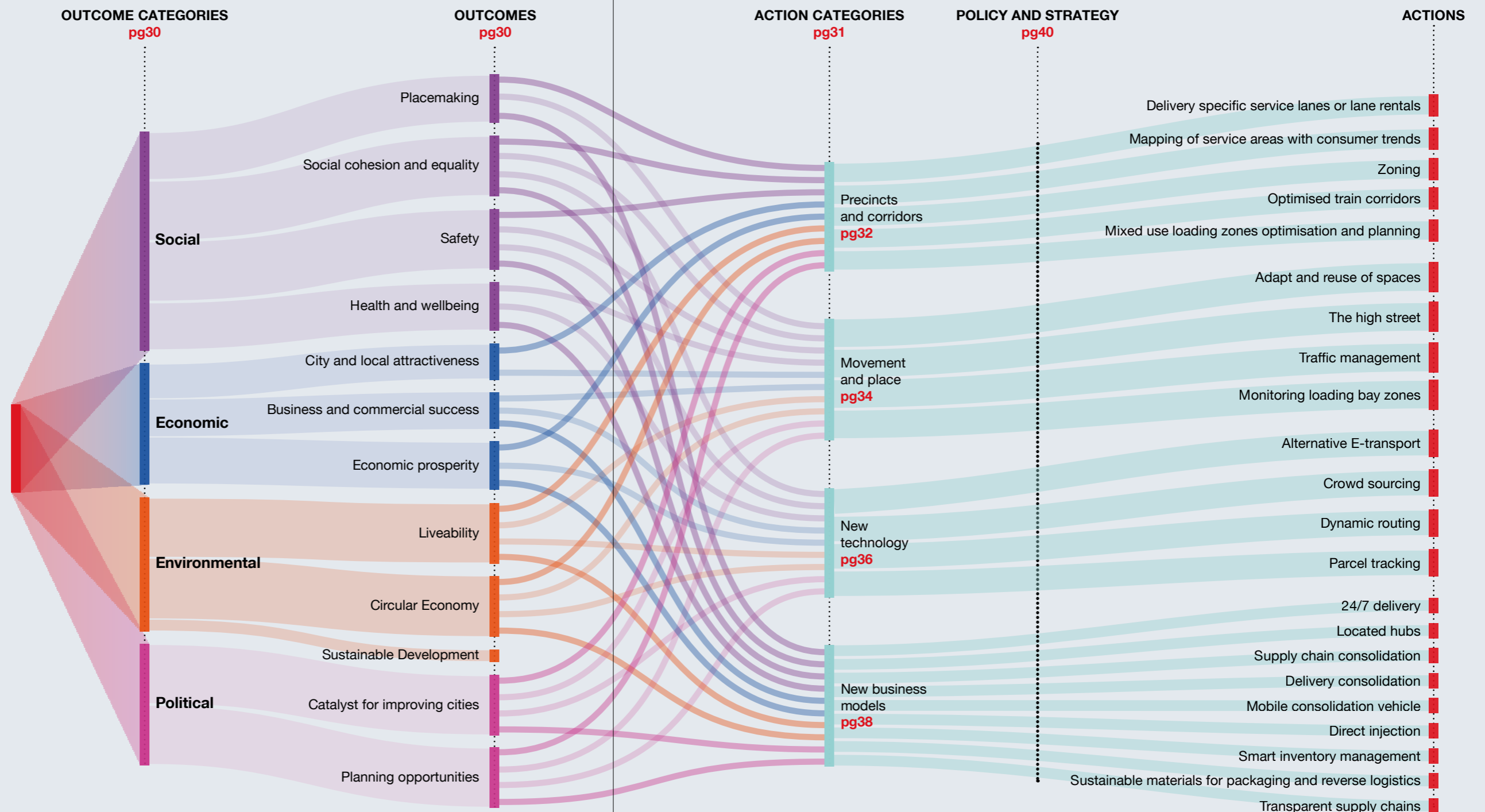
Of these, approximately **30%** are categorised with high-threat-to-life injuries²⁶.

Outcomes and actions

The Australian logistics industry can, through targeted action, effect social, economic, environmental and political change that will improve our cities and planet for future generations.

By considering the outcomes that consumers, businesses, employees, local neighbourhoods, cities and global networks seek for a resilient, sustainable future and examining the linkages with all facets of logistics activities, a series of actions are suggested.

What do we want to achieve for our cities?















How do we achieve these outcomes in our cities?

Figure 2: Framework for the future of logistics

Outcomes and actions

Outcomes and the benefits of a sustainable approach

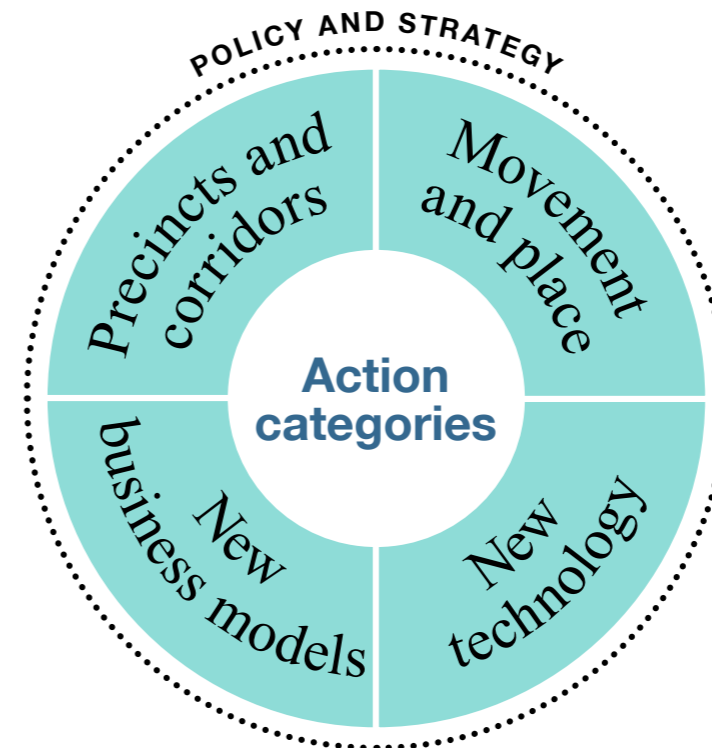
Social outcomes	What?	 Placemaking	 Social cohesion and equality	 Safety for all consumers, local community, employees and employers	 Health and wellbeing
	How?	<ul style="list-style-type: none"> Enabling vibrant and accessible urban experiences for all Supporting local initiatives Enabling positive social interaction Night-time and 24/7 services and deliveries 	<ul style="list-style-type: none"> Accessible services for all including inclusiveness and diversity 	<ul style="list-style-type: none"> Ensuring rail and road safety Ensuring safe and active streets Ensuring safe services and deliveries 	<ul style="list-style-type: none"> Improving health and wellbeing of communities Supporting physical activity and active lifestyles by enabling safer roads for pedestrians and cyclists
Economic outcomes	What?	 City and local attractiveness	 Business and commercial success	 Economic prosperity	
	How?	<ul style="list-style-type: none"> Inward investment Attracting local community Increasing land and property value Optimising efficiency of networks (road, rail etc) and movement Reducing congestion Placemaking and safe cities 	<ul style="list-style-type: none"> Business support Creative and innovative thinking Business resilience and efficiency Integrated and automated systems Streamlined services, supply and demand chains 	<ul style="list-style-type: none"> Supporting local businesses Supporting local employees Job creation Enabling local resilience Global competitiveness 	
Environmental outcomes	What?	 Liveability	 Circular Economy	 Sustainable Development	
	How?	<ul style="list-style-type: none"> Clean and efficient transport Zero carbon offsets and electric vehicles Reducing air pollution improving air quality Reducing and addressing noise pollution Promoting flexible transport schemes for supply and demand Optimising land use 	<ul style="list-style-type: none"> Decreasing dependency on non-renewable resources Repurposed and reused spaces Energy and waste efficiency Clean and transparent supply and demand chains 	<ul style="list-style-type: none"> Sustainable behaviours Climate resilience Sustainable structures and infrastructure Smart and connected cities 	
Political outcomes	What?	 Catalyst for improving cities	 Planning opportunities		
	How?	<ul style="list-style-type: none"> Resourcefulness Overcoming disruptors Leading and adapting to new normal 	<ul style="list-style-type: none"> Supporting regeneration processes Allowing flexible and micro solutions Global competitiveness 		

Outcomes and actions

Action categories

With the goal to enable cities and towns across Australia to thrive socially, economically, environmentally and politically, the industry can make changes to how it functions with the city. It can do this through policy changes, business models, technology, precincts and corridors, and movement and placemaking.

The following section digs deeper into the action categories referred to in the framework diagram on pages 28-29, with examples of practical actions for each category.



Key considerations for implementing change

No one size fits all

All cities, communities and businesses face a range of different issues, constraints, priorities and requirements. This means that each city, community and business must tailor a bespoke approach to operating in the 'new normal' to thrive socially, economically, environmentally and politically.

Big data is key

The importance of big data has been seen across most industries, from monitoring a patient's condition in healthcare, to programming autonomous manufacturing machines, to using data to help determine teaching techniques in education. Big data will play an important role in the future of Australian logistics from the way companies determine volumes of orders, how businesses determine operation plans, the consolidation requirements or optimisation of loading bays. The collection and processing of big data throughout supply chains should be prioritised in order to make decisions to improve network efficiency and performance.

Outcomes and actions



Actions which provide key opportunities to develop the physical and urban form of cities, through precincts and corridors

These solutions, which look at transportation systems and infrastructure, aim to avoid disruption due to extreme concentration of traffic through limited corridors and high-density areas.

The solutions look to provide greater services to more geographic precincts through interconnected systems so they are more easily accessed by users and are ultimately more inclusive. They address issues with last mile logistics, delivery service and local loading, as well as utilisation of land and existing assets.

Delivery specific service lanes or lane rentals

Using existing infrastructure and allocating specific lanes for freight vehicles to deliver goods during peak periods has been shown to improve traffic flow. This gives the priority to delivery vehicles during peak hour, which can reduce delivery times, but does increase congestion on other lanes of traffic. Barcelona was one of the first cities to introduce specific lanes successfully.²⁷

Mapping of service areas with consumer trends

The logistics industry can collaborate with government and other businesses to map living and working trends, locality and where clusters of people are living and working. This will help optimise service of precincts, determine which corridors to utilise for movement and where new distribution and mini-distribution centres can be located.

Optimised and sustainable train corridors

Utilising unused space on passenger trains and optimising existing corridors provides an opportunity to achieve value for money and reduce costs to both the fare payer and taxpayers. By achieving a modal shift from road to rail, this solution also results in environmental and societal benefits beyond the immediate logistics supply chain.

Medium to long distances provide the passenger rail network with an opportunity to compete with road-based deliveries. Spare passenger capacity throughout the passenger train network at certain times of the day can be utilised efficiently to transport goods.

The rail network connects cities to cities and suburbia, which could be integrated with sustainable first and last mile deliveries and therefore provide an opportunity to be a key delivery partner of sustainable city logistics.

Stations will need to ensure that they have appropriate facilities to accommodate goods and any services offered. A service proposition will

also need to align with what retailers and consumers want and address the key factors that are important to the operation of logistics providers as well as addressing consumers and Train Operating Companies' (TOCs) needs / requirements.

Additionally, new electric freight trains can be introduced to the fleet in order to further drive the sustainability of freight by rail. In comparison to diesel locomotion, electric freight trains offer significant fuel economy, reduce smog and generate zero emissions at the point of use. If equipped with regenerative braking, electric trains would also be able to feed electricity back into the grid with minimal losses.

Zoning

Zoning occurs during the design phase of city logistics and identifies specific locations for hubs to effectively plan for the mass delivery and movement of goods. While this requires significant predictive analysis to determine where growth areas will occur, effective zoning can greatly increase overall delivery efficiency through cost and congestion reduction.²⁸

Similar to agile consolidation hubs, selective zoning prevents mass daily deliveries by manipulating the pick-up points for consumers based on density and congestion. Daily consolidated pick-up points alternate during the week to reduce the quantity of deliveries to certain areas. Customers can select their pick-up points depending on the day.

A potential solution to congestion pricing for online deliveries. For example, large office and apartment buildings will have designated delivery days; delivery on other days will induce increased delivery prices.²⁹

Ultimately, zoning deliveries is a more lenient way of introducing exclusivity zones. Exclusivity zones give access for certain vehicles based on size, emissions, passengers and freight weight. This aims to reduce the number of carbon-heavy vehicles and increase lower carbon impact vehicles. It also encourages companies to transition their fleet to meet the requirements of the city depending on congestion or pollution.

Mixed use loading zones optimisation and planning

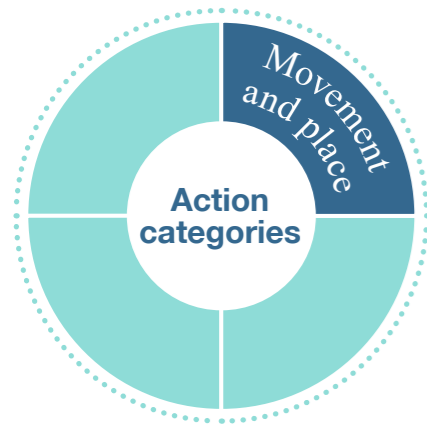
Loading bay optimisation can be improved by considering urban planning and better positioning loading zones around the city for more efficient distribution

New York has tested a pilot program which uses curbside parking spots as temporary neighbourhood loading bays from 7am to 7pm to reduce the number of double-parked cars and vans in residential areas.²⁹

New York also allows different uses of the curb space throughout the day. For example, cafes can use the curb as lunchtime seating, after which the curb converts to a drop off and parking zone from 2pm to 6pm. Bars and restaurants can then use the space again from 7pm to 11pm. Westminster City Council in London has also been implementing this optimised planning which in turn has reduced traffic fines for services and deliveries.



Outcomes and actions



Actions which enable positive placemaking and provide diverse movement opportunities

These solutions look to address current challenges facing our cities, including the non-fixed nature of workplaces, re-timing, road space use over 24 hours, new living and working lifestyles, regional living trends and the rise in the 15-minute-village.

These solutions also address the trend in consumer behaviour from retail store to online shopping and the resultant increase in unused retail space.

The high street concierge

A central management hub that collaborates with other businesses in the high street, termed a 'high street concierge', is proposed in order to service the 15-minute-village and communities. This concierge will optimise delivery and create additional experiential opportunities for community spaces and neighbourhoods that have been recently impacted by downturns in retail footfall. Linking the high street concierge to purposeful and well-planned mini distribution centres is key.

Mini distribution centres

Connecting distribution centres to purpose-planned and built mini distribution centres in local neighbourhoods and the high streets will help service the community now and in the future and minimise unnecessary movement of goods and people. These mini distribution centres will be where freight is broken down into smaller batches and distributed across the high street and to homes through low-carbon delivery methods such as bikes or electric vehicles.

Sustainable movement

The need to reduce carbon emissions and address climate change means that sustainable transport solutions should be prioritised in businesses. Removing particulates from the air and protecting future generations is fundamental. Consequently, electric vehicles and bikes should be part of all the last mile delivery solutions.

Adapt and reuse of spaces

An immediate way to address additional demand for logistics facilities closer to consumers involves adaptive reuse and repurposing of unused spaces in cities, such as shopping centres and car parks, into warehouses or distribution hubs. This is a feasible solution to get bulk deliveries very early and then break them down and deliver using small electric vehicles. The reuse of car park spaces has been empirically successful in London in some instances and can also be used to support environmentally and economically friendly bike deliveries for smaller distances. By also shifting some of the production to these local areas, and indeed more in Australia, there are benefits in faster fulfilment and reduced carbon footprints.

Traffic management

An effective transport system requires accurate tracking of vehicles and live data on traffic and loading bay availability to ensure efficiency. This data needs to be collected through multiple sources. A primary source of data can be a Traffic Control Room which manages the flow of traffic, focusing on freight vehicles, while loading bay monitoring and parcel tracking data can also contribute to a more holistic picture. For example, Transport for London, is developing a traffic management system which will greatly reduce congestion and improve reliability of deliveries.³⁰

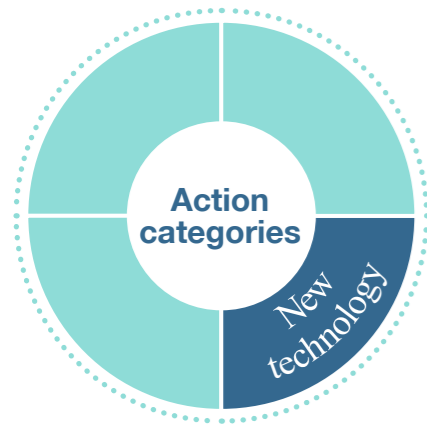
Monitor loading bay zones

Monitoring loading bays for traffic control ensures that the timing of delivery vehicle arrivals and departures match the allocated times within the system. This reduces the incidences of delivery vehicles 'circling the block' to wait for loading bays to become free, potentially causing additional congestion on the surrounding road networks.

These bays can be optimised by tracking delivery trucks and using live data on the availability of loading bays.



Outcomes and actions



Actions that leverage innovative technology, processes and approaches to shape the way deliveries are made in the last mile

Alternate e-transport

Adoption of e-vehicles, electric bikes, scooters and other non-typical delivery methods to complete the last leg of delivery brings environmental benefits alongside congestion reductions.³¹ E-transport is a low carbon alternative as it reduces the number of truck deliveries, and can improve delivery times as the smaller delivery vehicles can navigate traffic more efficiently.

Smaller vehicles, such as bikes, have less visual impact on streets and can get closer to a contact point for loading and unloading. These reasons have contributed to the strong uptake of bikes for food delivery. Yet, as a large number of alternative vehicles take to the road, other challenges arise, such as safety and footpath congestion, that require greater consideration.

Also important to consider is the energy required for E-transport modes. As there is a shift away from fossil fuels to more sustainable sources of energy, consideration needs to be given to these transport infrastructure requirements.

The electrical grid must meet different needs and “power must be made available in the right place at the right time to charge and operate a wide variety of vehicles, and to take advantage of their ability to store and regenerate electricity themselves”.³²

Crowd sourcing

Crowd sourcing involves using existing public drivers to make peer-to-peer deliveries. This method utilises the existing network and drivers’ current routes to deliver small amounts of goods without adding vehicle movements to the network. It can also be used to incentivise couriers to take additional deliveries when they have available space.

Utilising this large public resource can greatly reduce the number of delivery vehicles, thereby reducing congestion and emissions and improving efficiency. Beyond using private passenger and delivery vehicles, crowd-sourcing methodologies can also be applied to seek network users in ride share services, scooters, bikes or on public transport for delivery.

Deliverers are found through apps, which prioritise beneficial services through cheaper prices and quicker transport times. These apps and associated smart technologies can collect data and provide valuable information to other networks. Used in this way, crowd sourcing can provide accurate timing and monitoring of public transport vehicles and live routes based on every available transport method, including walking, cycling, ride sharing and e-scooters. The aim is to promote the best method of transport for both the user and the city by using public transport and eco-friendly services which reduce single drivers on the road.³³

Dynamic routing

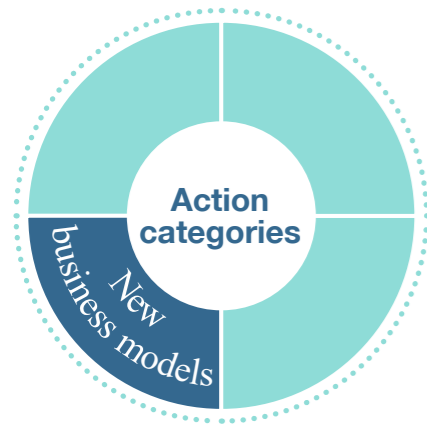
Dynamic routing uses data and predictive algorithms to analyse the best routes for freight vehicles to make deliveries. Usually privatised, each operator’s sole purpose is to optimise the routes of delivery trucks, thereby reducing costs through avoiding congestion and improving delivery times. The implementation of dynamic routing based on order volumes and delivery times can increase customer satisfaction through improved truck flow and delivery. Adaptable for complex fluctuations in delivery volume, dynamic routing is a powerful tool for saving time and costs.

Parcel tracking

Parcel tracking involves marking delivery parcels via GPS chips, which generates data to better inform delivery services. Evertracker is an American company using this technology to support logistics decisions and improve the reliability and security of parcel delivery.¹⁹ Tracking parcels, while not directly addressing the issue of road congestion, is an important step in improving inventory management. The increased digital monitoring of goods themselves through parcel tracking can improve security and reliability, which can be valuable for business rating and customer satisfaction.



Outcomes and actions



Actions that enable businesses to thrive in the ‘new normal’ while also benefiting consumers, communities and cities

24/7 delivery

Operators or facility owners may mandate the delivery of some or all goods outside of peak times to take advantage of minimal congestion. This is referred to as re-timing deliveries and has also been implemented in the waste collection industry. Re-timing improves delivery times and safety for operators and also reduces emissions by lowering the total time vehicles are on the road.

Out-of-hours delivery can also alleviate challenges around peak periods for personal deliveries, such as Christmas, but may not be feasible in all cases due to customer requirements for delivery times, handover regulations (including cold-chain compliance) or readiness of goods. Night deliveries can be effective for stores, like grocery shops and pharmacies, but may also include deliveries to smaller warehouses that enable shorter distance delivery the following morning. New York has 500 companies participating in a voluntary city program where they deliver goods after 7pm and before 6am. São Paulo in Brazil has also adopted out-of-hour deliveries.²⁹

Consolidation hubs

Traditionally, a consolidation point is the penultimate leg of the goods movement before the last mile. A consolidation hub is a logistics facility that is located in relative proximity to the area it serves and aims to get the best network and place outcomes for the services.

Goods destined for the area are delivered to the consolidation centre by vehicles from multiple suppliers. The goods are then sorted and consolidated onto fewer vehicles, which make the delivery to the final destination more efficient by reducing congestion and reducing delivery costs. While a consolidation centre is not strictly a warehouse, it can provide short-term storage until goods are required by the customer. This allows users to take advantage of bulk buying discounts when space is limited on their own premises.

Supply chain consolidation

Collaboration between businesses to share delivery transport for purchases, or procurement-led consolidation can lead to a reduction in vehicle trips as well as financial and environmental benefits.

Grouping orders is a simple solution that does not involve a major shift in the way goods are purchased. Regardless of the number of orders placed from tenants in a given period, the supplier only makes the delivery on a given day or date. Individual orders are ‘bunched’ so they arrive together on a single vehicle. This reduces the overall number of trips needed and associated emissions. It also lowers delivery costs for the operator and where the minimum order value is increased, leads to less order processing costs for the customer. This may also result in more efficient use of loading dock infrastructure within buildings.

This approach is ideally suited to daily fresh, frozen or chilled consumables for office, retail and food and beverage tenants. Where customers require immediacy of delivery, the ‘bunching’ of orders is not a satisfactory solution. Ultimately, any supply chain consolidation will be most effective when all available information which can inform intelligent management systems is available.

Delivery consolidation

The goal of delivery consolidation is to reduce the number of vehicles entering a target area by ensuring their carrying capacity is fully utilised. Consolidation can achieve a significant reduction in vehicle movements to a specified destination with an associated reduction in emissions, congestion, noise pollution, traffic movements in absolute terms, peak traffic levels, queuing and loading bay area requirement. It can also help companies save on costs with efficient optimisation of deliveries.

Mobile consolidation vehicle

Mobile consolidation vehicles can be parked vans in densely populated locations, from which smaller couriers deliver. They have the same goal as consolidation centres, to reduce the number of deliveries to the same area. This model, based off the hub and spoke design, enables the large hub, in this case the van, to move to where the most amount of deliveries will occur. This agile approach can be more reliable and improve delivery times.

Direct injection

Direct injection involves shipping large volumes of goods to a central location, and then distributing them (often during peak times) via boat, train, vans or bikes.³⁴ The direct injection can be done in off-peak times to ensure goods are centralised prior to the peak delivery period. Smaller delivery vehicles can then make shorter deliveries, reducing costs and time.

Smart inventory management

Inventory management involves improving supply chain monitoring and tracking to use storage space and schedule deliveries more efficiently. Improved inventory management can ensure deliveries are executed effectively and both warehouse storage and truck utilisation are maximised. Smart inventory management can be a relatively cheap way to improve the operation of storage facilities and last mile logistics.

Sustainable materials for packaging and reverse logistics

Finding alternative, smart and sustainable packaging materials can significantly reduce a company’s environmental footprint.



Using a standardised type of packaging can also help companies achieve more efficient packing of parcels onto trucks and reduce the amount of empty space and wasted material associated with generic box sizes. Companies should aim to use non-plastic materials or specific materials that mould to the contents to minimise air gaps. This solution will require consideration of the safety of goods and their protection within the packaging.

Transparent supply chains

It’s now more accessible than ever to use technology to map supply chains and provide data to consumers about where their products come from and how their products are delivered to their door.

Business models that are able to digitally verify products and information, trace systems and share information with ease will appeal to the change in conscious consumers. OpenSC is an example of a company that uses technology to help create transparency and traceability in supply chains through a verification, trace and share model.

Outcomes and actions



Policy has an important role to play in improving the efficiency of a city, its economy, the environment and its people.

As government is urged to enable a positive future for our cities and industries, it is the opportune moment to revise policy and strategy. Now is the time to create a set of clear policy goals, aligned to long-term strategy and action, that enable the logistics industry to be at the forefront of and contribute to Australia’s sustainable and resilient future.

A series of proposed actions explore policy changes which can improve city logistics without creating negative externalities. These initiatives can be explored by governments and local authorities with the intention to create economic, social and environmental benefits.

Policy changes have the power to control the uptake of technology in a city and therefore plays a vital role in ensuring the efficiencies and optimisation of supply chains are effectively managed.

These solutions aim to provide businesses and government agencies with an enhanced awareness of the bigger picture of supply chain logistics and the potential impacts of policy changes on the area.

Policy changes need to be constantly adjusted and mandated alongside rapid advancements in health, technology and the environment to create significant movement. From drones to autonomous vehicles to micro-mobility, authorities must ensure they keep up to date with what the market is using and work collaboratively to deliver a desirable result for all.

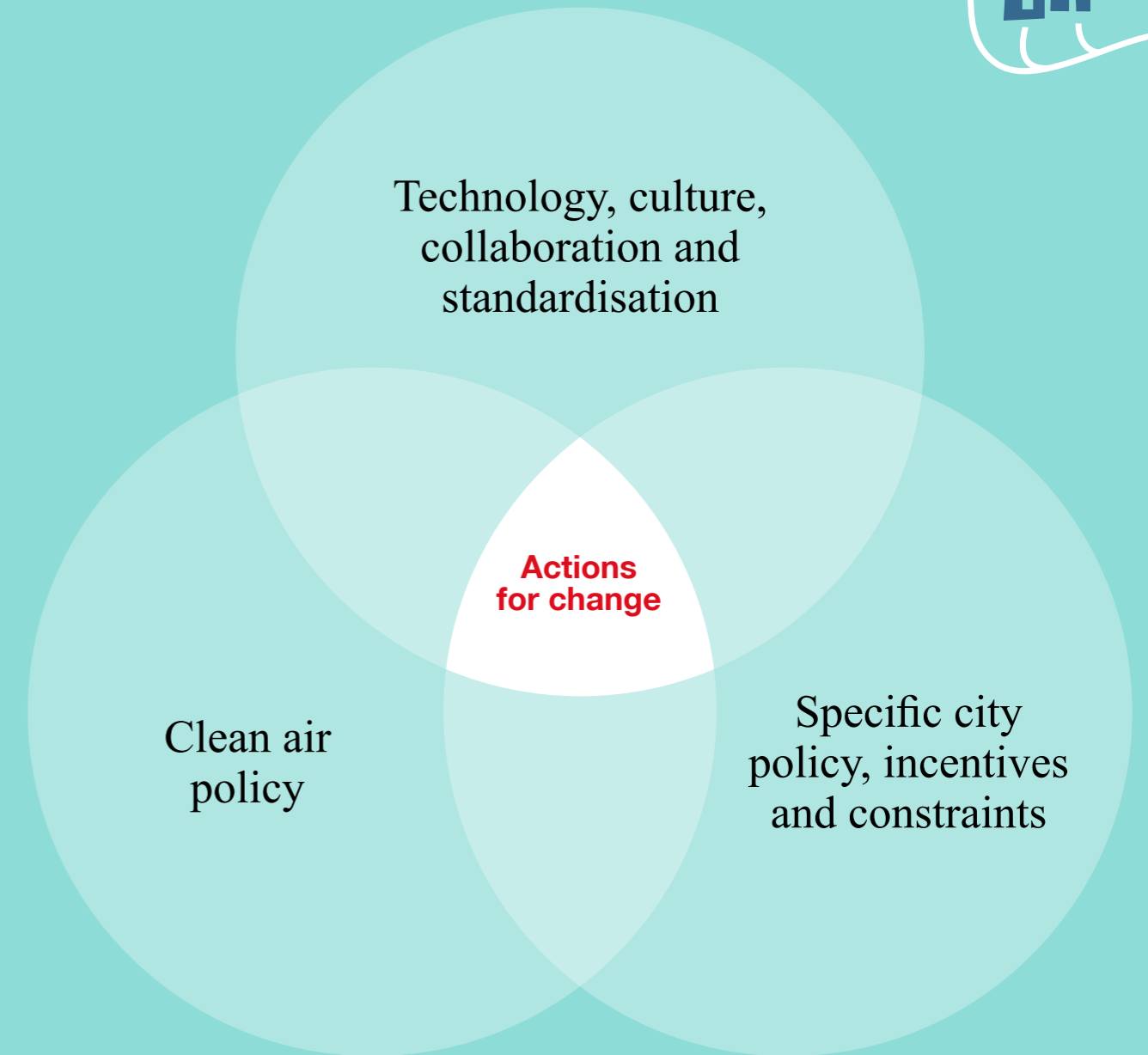


Figure 3: Proposed actions

Actions for change

Technology, culture, collaboration and standardisation

To improve the interfaces between our logistics industry and our city environments, we need to revisit strategies and policy. A holistic approach to outcomes for public health and wellbeing, city corridor action and value and city transport improvements would be a beneficial basis for future-focused policy.



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Technology and local support

Technology will inevitably enable change and be a key driver for decision making and solution implementation. Technology will influence the requirements for the distribution network within the city, carry the goods and generate and collect data required to inform and monitor. Without adequate coordination and support from local authorities and governments, cities will not derive the benefits of technological advancements but will be subject to their negative impacts. To gain the best outcome for all stakeholders, technology needs to be used by governments to help make decisions. Big data will provide validation and justification for implementing solutions, while emerging innovations will continue to disrupt cities if authorities are not aware and prepared.

Technology, policy and infrastructure must be aligned to deliver benefits

New technologies alone will not create resilient and sustainable futures for the industry, businesses and the city. The full potential of these technologies can only be realised if the coordinated use of clear policy measures and infrastructure improvements by local, state and federal governments prioritise and support their deployment. Governments and key operators have the opportunity to work together to identify priorities and opportunities to align, both of which can derive the benefits of an efficient supply and demand chain network. This collaboration will allow the optimised deployment of solutions that incorporates the characteristics of the city or town in question as well as the key operators and their capabilities.

Government, local authorities and businesses must continuously monitor and improve the network

Governments and local authorities have a critical responsibility to implement appropriate policy, monitor the operation of the network and respond to change with appropriate measures and enforce initiatives where required. As the owner of the negative externalities generated by unsustainable and non-resilient networks, authorities must have access to data to monitor the operation of the system and measure the benefits and outcomes. Access to the right data will enable correct and timely interventions to continue to promote effective measures and to disincentivise or enforce against negative actions within a continuous improvement framework.

Infrastructure must cater to a wide range of solutions

The supply chain process is changing and the infrastructure to support it must also change. Fluidity in infrastructure is enabling adaptation to changing delivery methods, exemplified by cities converting street parking into delivery lanes during peak hours. The predominant mode of delivery in each city into the future is uncertain, based on operator selection and technological advancement, and therefore the infrastructure designed to enable the deliveries must be robust and flexible as well. The capability of the infrastructure to handle technologies from drones to AGVs to mobile lockers to bicycle couriers will impact upon the local authorities' ability to deliver the benefits of supply chain improvement initiatives as they rise and fall.

Intelligent Management Systems managed by governments

The data for delivery services may be provided to, and monitored by, local authorities to enable the efficient implementation of policy changes which best reflect the needs of the city. This would improve the ability of policy actions to address the needs of each city in a targeted fashion and enable the impacts to be monitored during the implementation stage, enabling focused interventions and adjustments.

Behavioural and business mindset changes

While there are several innovative business, precinct, movement and policy focused changes that can be made, the biggest force in reducing our environmental impact is reduction in consumption and operational change. Incentives to nudge behavioural and business mindset and create targeted incremental change is going to be of most value to our future cities. In prompting people and businesses to do things differently through policy drivers, we can achieve greener, cleaner, safer and less congested movement.

Actions for change

Specific city policy, incentives and constraints

Targeted emission goals to improve air quality and CO₂ emissions

Targeted goals for CO₂ emissions and air quality help constrain supply chains to improve systems with more efficient and environmentally friendly procedures.

Taxation on deliveries within zones including ultra low emission incentives

Placing a tax on vehicle deliveries within certain zones incentivises operators to optimise truck stock and limit the number of vehicles used to make deliveries in order to maintain competitive pricing. This can reduce congestion and lead to companies sharing their resources to gain the benefits of reduced taxation.

A tax can also be adjusted to meet certain goals based on non-financial measures, such as emission or congestion. For example, the London Ultra-Low Emission Zone, introduced in April 2019, is a fee charged to the most polluting types of motor vehicles in Central London. In its first 4 months, the fee reduced the number of polluting vehicles by 35% and saw a 20% reduction in the level of emissions. The fee also reduced the total number of vehicles entering the city by 13% (April 2019 compared to Feb 2017).³⁵

These incentives can also shift businesses to focus on other sustainable and optimised methods of delivery, such as using existing train networks, bicycle deliveries and kiosk collections.

Zero emission vehicle incentivisation

Incentivising the use of carbon-friendly vehicles increases the uptake of EVs and the realisation of their environmental benefits. This goes alongside infrastructure improvements, such as charging stations and priority lanes and loading bays, to ensure enough resources are available for EVs to make deliveries. In addition to the environmental benefits, this would incentivise the uptake of EVs by giving companies that adopt the vehicles greater scope to reduce delivery times and costs.³⁶

Financial incentives

Financial incentives play a crucial role in controlling operation within cities, whether they are positive or negative. They are commonly implemented through policy changes as government bodies increasingly target congestion and pollution. These changes are helping to deal with various challenges along the supply chain network and improve city function.



Financial incentives take many forms. Taxation is a common form of incentive used to manipulate the flow of traffic within cities. Other methods, such as smart fares and permits, limit the number of vehicles within cities while incentivising green vehicles, which helps to combat the environmental impacts of increased congestion.

Smart fares

Smart fares involve fees for driving based on the vehicle's environmental, economic or social impacts. This gives priority lanes for EVs, cars with multiple passengers and delivery vehicles that maximise their load. This incentivises lower carbon impact vehicles, and companies adopting these practices will have access to faster delivery times.

Additional adjustments to smart fares involve having fees for access based on distance travelled throughout the city, total emissions or quantity of freight delivered. These practices are being implemented in San Diego, which has seen an increase in EV uptake.³⁶

Trading permits

Trading permits put a limit on how many delivery trucks can enter the CBD per hour or day in the form of credits, with unused credits able to be given or sold to competitors. This theory is based on a system like the Carbon Credit Scheme and aims to reduce the number of vehicles in the CBD and the emissions they produce.³⁷

Delivery consolidation constraints

Policy can influence decision-making for consolidation by ensuring vehicles only enter the CBD with a certain capacity. This helps to reduce vehicle movements to a specified destination with an associated reduction in emissions, congestion, noise pollution, traffic movements in absolute terms, peak traffic levels, queuing and loading bay area requirements.

Constraint on material used for packaging

Providing policy constraints or incentives for companies to use alternative, sustainable packaging materials can help companies achieve more efficient packing of parcels onto trucks while also aiming to reduce waste and use of other non-biodegradable materials.

Regulatory transport and delivery times

Council and government policies can regulate the times at which logistics transport services can enter zones or transport goods through certain corridors or routes. This works to spread the transport and delivery load over the peak periods, which results in improved traffic flow and reduced congestion, as well as improvements in loading bay processing rates.

Freight deliveries in Paris's CBD, for example, are restricted to outside daylight hours and delivery to smaller hubs which are closer to the customer.²⁹ In the morning, the last mile of deliveries is performed via bicycle or electric vehicles. Similarly, in Hamburg, Germany, fleets of electric tricycles carry packages the last mile.

Actions for change
Clean air policy

Some cities have used the unifying policy stance of clean air to bring city stakeholders, residents and industry together, all while incentivising technological advances.

This brings together:

- A value-driven policy and governance approach;
- A strategy and framework for measuring success; and
- Supported delivery of services and infrastructure.

City and state governments are able to more quickly bring about modal change through provision of critical infrastructure to support quieter, less polluting and more efficient modes of logistics delivery, and by leading the way with transport modality.

- NSW policy supports these approaches, at an aspirational level
- NSW Govt Climate Change Framework – net zero carbon emissions by 2050³⁸
- NSW State Health Plan – Direction One – “Keeping People Healthy”³⁹
- NSW Treasury Strategic Goals – “Three – Innovative and strategic policy, reform and delivery based on rigorous analytics”⁴⁰

– DPIE – “Our vision is to enrich the lives of people in NSW through our work on high quality planning... great design, culture, clean environments... and energy security.”⁴¹

– TfNSW – “The transport system is economically and environmentally sustainable, affordable for customers and supports emissions reductions”⁴²

The NSW Government’s strategic intent to upgrade all buses to Zero Emission standards is something that our logistics industry should leverage to secure aligned policy objectives.

Once infrastructure to support electric (EV) buses across suburban Sydney are underway, and NSW Energy support is in place for hydrogen buses on longer routes, it may be timely to advocate for an aligned road tax and 24-

hour delivery incentives to align with critical fuel/charging infrastructure provision.

The city value of transport modes switching to zero emissions will be constrained without wider logistics and construction traffic policy. There could be matching implementation of enabling strategies to incentivise the sequential upgrading of logistics delivery modes to zero emission models.

Clean air policy can only be effective if all controllable elements of air pollution are induced and enabled to lower or negate emissions.

Within the city environment, it may well be that infrastructure to support EVs will be rolled out within key transport and delivery corridors, which will bring opportunity to align logistics hubbing and delivery timescales with transport planners and policymakers.



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Later and further into the outer-suburbs and regions, policy again needs to be aligned around the real opportunity for hydrogen fueling and storage, and should be considered again in conjunction with suitable incentives to align with key transport modal shifts.

There is little doubt that this is a long game and must be seen as a path towards cultural and technological change, starting with incentivised pilot precincts and road corridors, before moving, as the price point lowers and fueling and charging infrastructure allows, to become state and nationwide zero-emission logistics normality.

There is little doubt that road-tax reform, zero-emission infrastructure and public transport provision, a clean energy policy and a clean domestic energy market, all need to sit in alignment

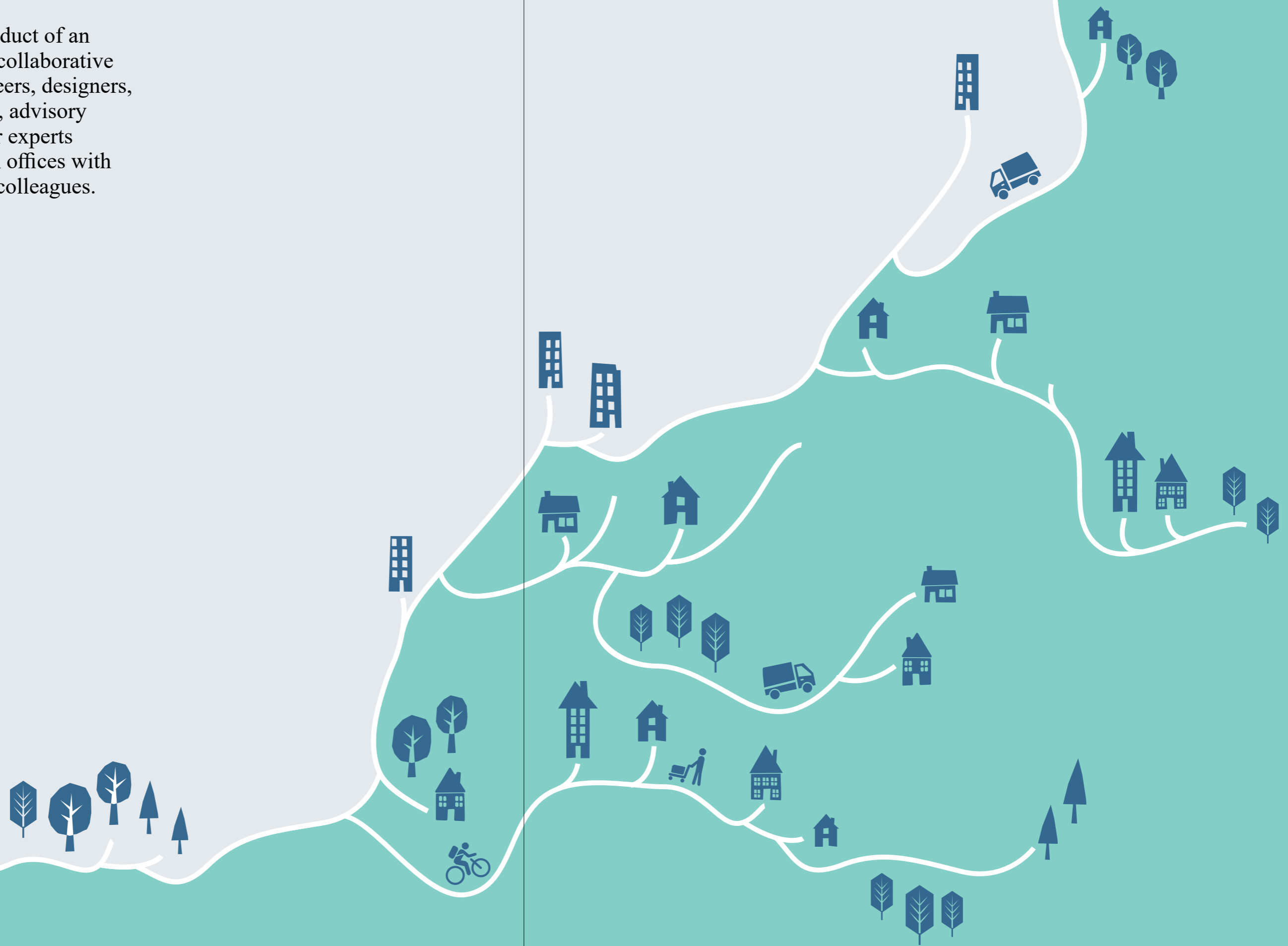
with the recognition that our cities need to be cleaner and healthier – and that we can achieve it. Logistics advocacy for policy alignment within this framework needs to be strong and it needs to be now.



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This report is the product of an Invest in Arup (IiA) collaborative study by Arup engineers, designers, transport consultants, advisory consultants and other experts across our Australian offices with support from global colleagues.



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