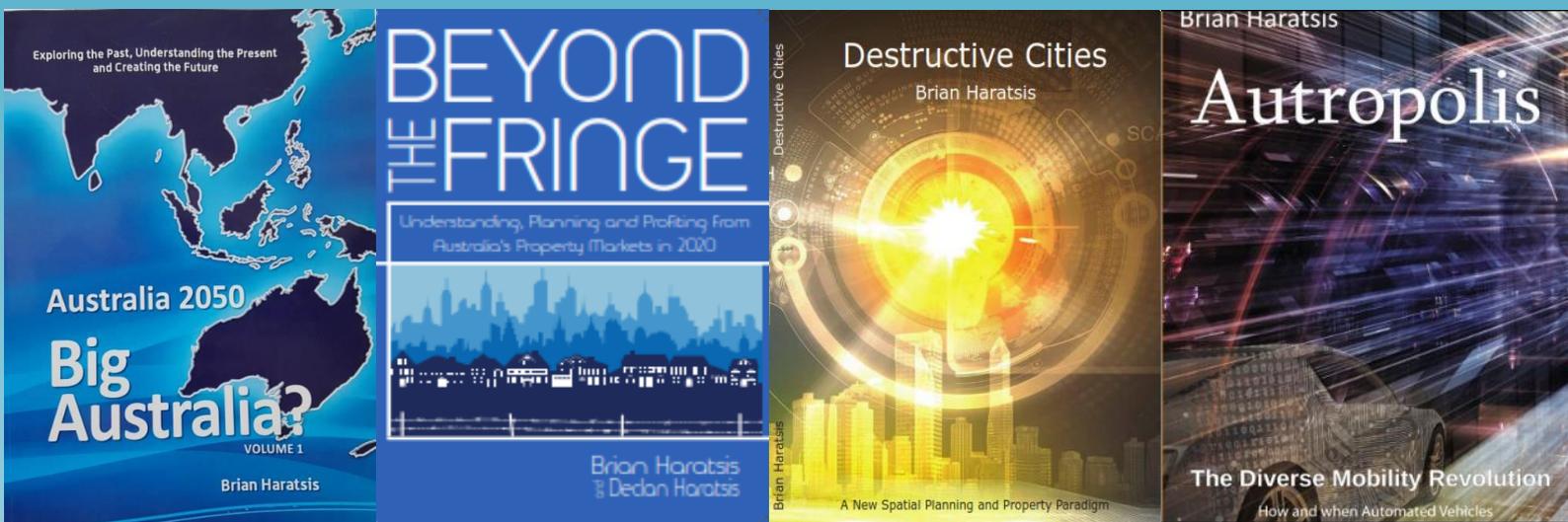


# SUSTAINABILITY TRANSITIONS IN EXISTING CITIES

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## TRAJECTORIES OF EXISTING AUSTRALIAN CITIES

'Poorly understood. Australia needs to reset its urban agenda'

'Australian cities are stuck in an 80's and 90's planning mould. Artificial Intelligence, PropTech and Automated Vehicles will bust open that mould by 2020'.

'Urban and environmental planners and economists still think that development contributions growth boundaries, environmental controls and artificial land supply controls will not increase land and property prices. THEY ARE WRONG. JUST LOOK AT LAND AND HOUSING PRICES'.

### Key Points

1. Australian cities and towns are on significantly different growth trajectories and are at different stages of city-lifecycle.
2. A significant increase in employment in the Business and Household services sector is forecast. Business services are critically important for Australia to support the export of services (MacroPlan, Reserve Bank of Australia, Destructive Cities). Future settlement planning for Australian cities should focus on supporting Business and Household services exports.
3. A significant increase in traffic congestion is forecast (Infrastructure Australia Audit 2015) in all cities. This will cost over \$50 billion annually.
4. Land prices are forecast to increase faster than inflation due to a lack of practical supply. Lot sizes and dwelling sizes will continue to decline.
5. Housing occupancy costs are forecast to remain high but relatively stable due to low interest rates (MacroPlan, ABS) until 2020. As interest rates increase major levels of housing stress will occur.
6. Household sizes will increase to mid-2020's then decline due to an ageing population.

7. Population aged 70+ to double by 2051.

		Total Pop	Pop Aged 60+	Pop Aged 65+	Pop aged 70+
<b>2017</b>	Series A	24,917,746	5,154,808	3,806,152	2,619,524
	Series B	24,781,121	5,152,420	3,804,770	2,618,691
<b>2051</b>	Series A	42,499,981	11,303,696	9,013,694	6,916,826
	Series B	37,955,917	10,166,330	7,989,835	5,993,181
<b>Growth 2017-2051 (Proportion of 2017)</b>	Series A	171%	219%	237%	264%
	Series B	153%	197%	210%	229%

*(Proportion of 2017 Population)*

Source: ABS Projections

8. Workforce participation rate for 60+ to increase significantly.
9. Retirement age is likely to increase to 75 years by 2041.
10. Automated vehicles will predominate by 2035. Fully driverless car fleets will have significant impacts on public transport and will, unmanaged, significantly increase traffic congestion (evidence suggests 30% increase in vehicles above current forecast increase in travel times of 30% prepared by Infrastructure Australia.) No new metropolitan strategies Plan Melbourne (2017), Greater Sydney 2056 (2017)<sup>1</sup>, Shaping South East Queensland (2017) take AVs into account. Mobility patterns inside Australian cities will change dramatically. Car ownership will decline dramatically. Commuting distances will increase dramatically. I have included my new book *Autropolis – The Diverse Mobility Revolution* (see Appendix 1), which makes the argument that a National Diverse Mobility Authority should be initiated by the Commonwealth to manage the introduction of AVs (Commonwealth Role).

<sup>1</sup> AVs are cited, Page 32 of Draft Greater Sydney Region Plan, 'Objective 3'

Managed introduction of AVs will improve the social sustainability of urban fringes and regional cities.

11. Inequality will continue to increase in cities as the inner and middle ring 10km 'fortress walls' continue to grow in the form of price barriers. These price barriers are driven by an increasing value being put on human capital. MacroPlan research for the UDIA in Sydney for example demonstrated that 50% of persons asked in Parramatta (commuting to Sydney CBD) whether they would take the same jobs in Parramatta if they were available said no. This is because Sydney CBD has the professional networks, job densities, education and potential for career enhancement, personal improvement and higher wages. Technology and the services economy are driving increasing centralisation in the inner 10km and this trend is being supported by Federal and State infrastructure plans. This centralisation drives high levels of productivity and high levels of inequality. Urban fringes and regional cities and towns are forced to rely primarily on low paid population driven jobs (e.g. retail, health, education, police). (See attached MacroPlan ICTC report Appendix 2 and MacroPlan UDIA report Appendix 3). This seriously affects the economic and social sustainability of urban fringes and regional cities.
12. There is a low level of understanding of the future of employment and the services sector. Planning philosophy in Australia is still firmly based on 'garden city' outcomes rather than affordable / low cost, equitable and productive urban living. MacroPlan have developed a tool for the Victorian Government which estimates job increases due to project investment as a starting point to understand the potential and opportunity to better distribute high income / high productivity jobs,
13. Artificial intelligence (AI) will fundamentally alter urban life and property development in a range of ways not yet articulated. This includes AI which is already more advanced in many industries than imagined. Key industries include:
  - Online retail – e.g. Amazon and intuitive purchase options suggested freight delivery routes, etc
  - Intelligent shopping e.g. remote / AI product selection
  - Automated Vehicles – e.g. computer vision, sensor negotiation, global positioning systems
  - Healthcare – remote diagnosis, personal diagnosis

- Surveillance automation (security)
- Online platforms (Google, Baidu, Alibaba, Amazon with vertically integrated value chains)
- Financial services – Fintech going global
- Robotics – in early phases of operation
- Personal Assistant – e.g. Google, Alexa Machine based voice and sight recognition are anticipated to reach 90% accuracy by 2020

'No transparency objectives or output standards have been produced for AI'.

The growth in non-routine cognitive employment will be driven by AI. To attract these jobs this will be underpinned by high amenity, collaborative, productive urban areas (See attached ICTC paper Appendix 2). Currently Sydney and Melbourne are the key cities attracting the professional, scientific and technical sector, the communication and information technology sectors and high level research sectors (e.g. medical research).

The Commonwealth has many roles to play to reset Australia's urban agenda. These are summarised as:

- A. Evidence based planning / 'futures' based planning not trend planning.  
Setting objectives and KPI's for cities.
- B. Monitoring change in cities over say 10 years to monitor urban outcomes.
- C. Sustainability stretch targets for urban areas should be set and financial incentives used (e.g. reduced water usage, reduced energy, reduced private vehicle usage) to reward cities.
- D. Global connectivity targets (e.g. Australian Airport underspend Vs NZ, number of highly skilled migrants etc).
- E. Taxation should be reviewed along current research lines and stamp duties phased out in preference to land tax. This is consistent with the Henry Tax Review. States should be encouraged to reduce or delete heavy taxes on urban fringe development (e.g. levies, growth area infrastructure charges,

development contributions, section 94 contributions etc) to support 'low cost' cities which can attract the world's best talent.

- F. New business models for urban development need to be conceptualised. Destructive Cities points out that adherence to 'Garden City' planning philosophies supported by taxation of urban development has resulted in 'high cost' cities in Australia. Appendix 4 to this submission includes the basis for a new property and planning paradigms for Australia with a number of roles for the Commonwealth. (See Appendix 4 – Destructive Cities)
- G. Property market structures are a key driver in the trajectories of existing cities in particular:
- Monopolistic control of major development fronts and the archaic nature of existing property markets. Major international corporates are moving to control urban fringe land supply. The lack of a Property Futures market confines purchasers often to high 'spot prices' for land. For example it is not possible to forward purchase land for future delivery at current prices. This leads to artificial levels of short land supply despite 'claimed' significant 'theoretical' levels of land supply. Land and housing prices cannot increase if supply is sufficient
  - Land prices and house and land package prices should be monitored and published to contain housing prices and enable the possibility of sustainability transitions. Property futures markets could make a significant contribution to 'smoothing' land and housing price increases
- H. Institutional urban planning frameworks mitigate against equity and sustainability. Existing town planning statutory frameworks are based on 'additional' cost models. For example costs for higher standards of water sensitive urban design, higher quality open space, bike paths etc are passed onto consumers. Development contributions and infrastructure costs including profit margins and interest costs are passed onto consumers. Planning agencies cannot control actual land supply which generally operates at supply levels below which supply can contain price increases. Public sector policy frameworks are out of control and driving up housing and land prices.

For example, there is no requirement on planning, environmental and infrastructure agencies to contain regulatory requirements and costs of development. Accordingly Australian land markets 'price in' significant risk and take advantage of localised land supply shortages. This occurs both in the use of fringe urban land and brownfields development sites.

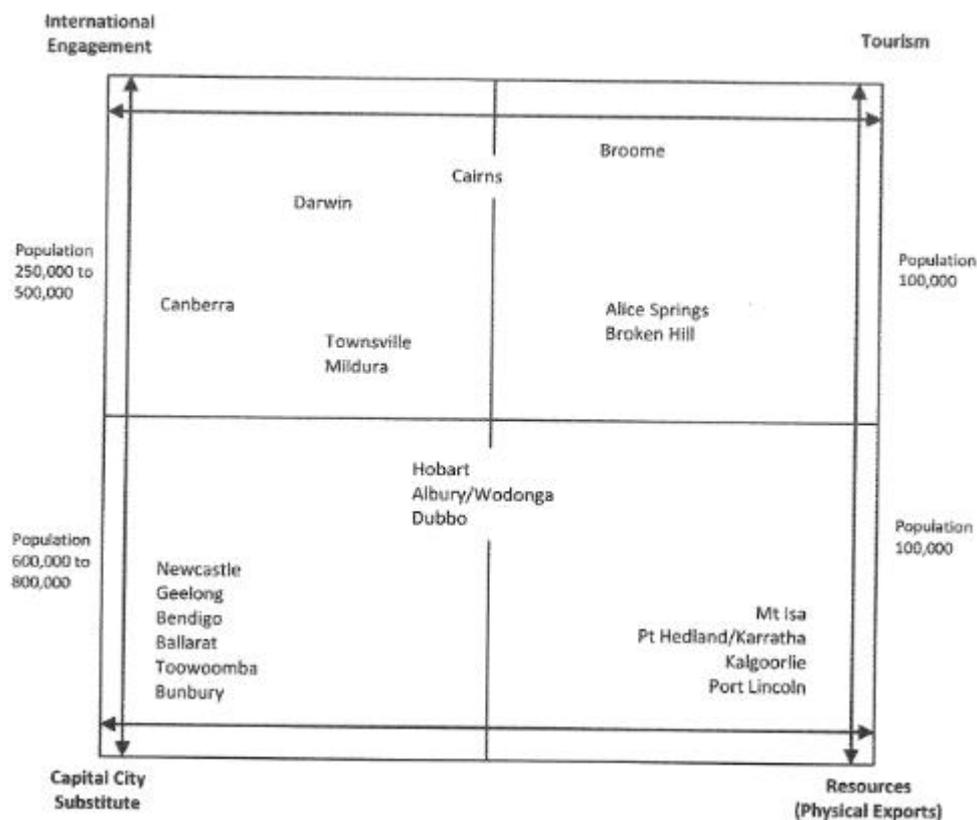
## GROWING AND TRANSITIONING SUSTAINABLE REGIONAL CITIES AND TOWNS

‘Private investment is the key. The public sector does not have the funds available’

### Key Points

1. From an economic perspective there are currently three types of regional cities and towns. Peri-urban (e.g. Ballarat, Wollongong), freestanding (Newcastle, Cairns) and Hinterland related (e.g. Kalgoorlie, Dubbo). In the future the concept of a new national urban grid could be considered to help direct policy making.

### **A New National Urban Grid for 2050**



Source: Page 219, *Australia 2050: Big Australia?* Brian Haratsis

2. Most regional cities lack basic infrastructure e.g. public transport.
3. Re-direction of urbanisation to these cities should not be done by increasing land / housing prices in capital cities (e.g. by utilising urban growth boundaries or through the use of punitive levies and infrastructure contributions). Positive policies can include new employment, increased land supply in regional areas and greater self-determination.
4. Significant taxation benefits for private investment in regional areas (outside of peri-urban areas) should be considered as a substitute for lack of public funding.
5. State and Federal Government agencies should be significantly relocated outside of capital cities. State Government account for over 70% of public sector employment numbers. *(See Appendix 5)*
6. Population driven services provided by Government should be benchmarked so that regional centres get an equitable share of not only customer service jobs (e.g. school teachers) but 'back of house' white collar professional jobs. MacroPlan has delivered an audit and diagnostics planning tool for regional Victoria which calculates infrastructure, service gaps, estimates and future service requirements based on an equitable share of the services sector. *(Refer to Appendix 5)*
7. Business services and technology are critical to the future of regional Australia. Identifying sectors which can be located in regional Australia 'naturally' from an economic perspective are important. Key focus areas should be:
  - Defence (e.g. procurement)
  - Education (e.g. international)
  - Agricultural technology
  - Health (e.g. not only acute but the full range of allied health)
  - Freight + logistics

8. There are examples where some of these sectors combine to create vibrant freestanding economies (e.g. Newcastle, Cairns). However public underinvestment, particularly in tertiary education and health means that many regional cities cannot grow and/or retain the talent necessary to grow business services sectors.
9. Regional information and data availability is poor. It is often difficult for the private sector to invest due to the lack of relevant data. This is exacerbated by low levels of local self-determination.
10. Regional cities and towns are ideal to trial and introduce Automated Vehicles, specifically automated shuttle buses for reliable, affordable, inexpensive public transport. Details of the shuttles are contained in Appendix 1. Exciting trials of AV's (now built in New Zealand) by HMI Technologies are underway in three capital cities. *(Refer to Appendix 1)*

## PLANNING TOOLS, MODELS, INDICATORS AND ALTERNATE FUNDING OPTIONS

1. The table below identified notable reports influencing settlement policy since 1975. Appendix 4 contains a review of the 'population versus environment' fallacy in Australia. According to the Department of Agriculture and Water Resources, less than 0.2% of Australia's landmass is urban and this number increased to 0.41% if rural residential land is also included.

Land use 2010-11	Area(sq.km)	Percent (%)
Nature conservation	604,671	7.87%
Indigenous + Other protected	1,163,676	15.14%
Minimal use	1,172,679	15.26%
Grazing natural vegetation	3,448,896	44.87%
Production forestry	103,494	1.35%
Plantation forestry	25,752	0.34%
Grazing modified pastures	710,265	9.24%
Dryland cropping	275,928	3.59%
Dryland horticulture	743	0.01%
Irrigated pastures	6,048	0.08%
Irrigated cropping	9,765	0.13%
Irrigated horticulture	4,552	0.06%
Intensive agriculture	1,414	0.02%
Intensive uses (mainly urban)	13,806	0.18%
Rural residential	17,632	0.23%
Waste and mining	1,860	0.02%
Water	125,542	1.63%
No data	401	0.01%
<b>Total</b>	<b>7,687,124</b>	<b>100.00%</b>

Source - Land Use of Australia 2010-11, Version 5, ABARES 2016

2. Understanding future settlement patterns in Australia has moved on from purely geographic and environmental factors to understanding globalisation and technology. There is a major role for the Commonwealth in providing data and interpretation of the likely spatial impacts of global value chains, global investment in urban and non-urban areas and technology. For example 'platform' technology offers such as Amazon which vertically integrates freight and logistics internal to the organisation has already resulted in new global value chains.
3. Future settlement patterns should also be based on understanding economic cycles and waves. Settlement patterns are an outcome of Commonwealth, State + Local policies. Transitioning for sustainability should provide tools for collaboration rather than a deterministic settlement pattern. *(see 'Projected Globalisation Wave' table next page)*
4. The Commonwealth can promote or show leadership in the emerging PropTech sector by creating a spatial data warehouse (see for example the Data Republic Model) and by curating a web based platform which focuses on urban and regional growth and development *(see Programmable cities / ScoopIT)*. Collaboration requires quality data.

## Projected Globalisation Wave – 1990 to 2050: Three Cycles of Change

1990–2010 Pre-globalisation cycle	<ul style="list-style-type: none"> <li>• Emergence of an open economy, global interdependence</li> <li>• Existing nation, region and city building methods not delivering economic, social or environmental outcomes</li> </ul>
2010–2030 Globalisation and ageing cycle	<ul style="list-style-type: none"> <li>• Initial integration with world economies based on free trade agreements and industry labour market requirements</li> <li>• Fast population growth and fast ageing population</li> <li>• Remote and regional development and infrastructure investment (particularly north of the Tropic of Capricorn) need hard and soft infrastructure and low-cost housing to become key priorities for nation and city building</li> <li>• Major infrastructure investment and planning to accommodate population and economic growth becomes essential</li> </ul>
2030–2050 Global integration and technology cycle	<ul style="list-style-type: none"> <li>• Comprehensive integration with world economies and global economic regulatory frameworks and the beginning of a new intergenerational era defined by a rapidly ageing international population</li> <li>• Significant increase in retirees and fast growth in the Pacific Rim, China and India</li> <li>• Re-urbanisation and densification of urban areas to accommodate aged and frail aged along with freight and logistics</li> <li>• Remote and regional development becomes the focus for nation and city building</li> <li>• The beginning of a new, technologically wired, Australia</li> </ul>

Source: Page 189, *Australia 2050: Big Australia?*

5. Basic monitoring of urban regional outcomes should be re-initiated. This was historically undertaken by BITRE albeit on a spasmodic basis. The Major Cities Unit approach focusing on report writing did not provide 'self-help' tools for regional Australia to prosecute a case for change. For example bi-annual aerial photography of urban growth and change would provide quality data. Computer based interpretive tools could be developed on an 'open source'

basis. There are emerging PropTech tools such as MapCloud which utilise this type of approach and are now used widely on a commercial basis. (See *Appendix 5*). Successful transitioning for sustainability will require quality data, the right interpretive tools and collaboration. A ten year project could be designed to meet these objectives.

6. AHURI has teamed up with MacroPlan to implement a project known as the Urban Living Initiative. The aim of the project is to monitor the performance of urban growth areas over time. The project complements the successful HILDA project (Household, Income and Labour Dynamics in Australia) which is funded by the private and public sector and provides longitudinal data on the lives of Australian residents. The Urban Living Initiative will provide longitudinal data on the performance and function of fringe urban areas.
7. Significant research has been undertaken by MacroPlan and other economists into wider economic benefits generated by agglomeration economies in urban areas. Settlement planning should understand and extend this field of endeavour to create a new paradigm because it has resulted in infrastructure investment being focused in capital cities and mainly benefiting inner and CBD areas.

## **APPENDIX 1:** AUTROPOLIS – THE DIVERSE MOBILITY REVOLUTION

## CHAPTER 2: UNDERSTANDING THE AV PROBLEM

Australian cities have been designed and built to accommodate and facilitate traditional motor vehicle based economies (freeways and road investment, manufacturing plants, fuel storage and distribution, car parking etc.) and motor vehicle based social networks (suburbia). Motor vehicles or horseless carriages with internal combustion engines (ICE) as they were known in the late 1800's replaced horse driven transport based on comfort and efficiency. Faster travel times, longer distances, plus multiple vehicle ownership increased gross domestic product, city populations and suburban areas but essentially horseless carriages performed the same function as horse driven vehicles. From an economic perspective until the late 1980's motor vehicles serviced the needs of modern economies based on manufacturing and export base of primary and secondary goods and still accounted for over 80% of all journeys to work.

The first oil crisis in 1973 and the energy crisis of the 2000's was a timely reminder that the internal combustion engine value chains became more difficult to function as ICE motor vehicles grew in numbers. 'Peak oil' production, rising fuel costs, traffic congestion, pollution and the geographic expansion of suburbia led major capital cities to review metropolitan strategies. In essence the new planning principles and strategies attempted to implement 'sustainable development' and 'sustainable transport' outcomes to protect cities from carbon pollution, traffic congestion and to protect low income groups from high fuel prices (primarily through improved public transport networks). In 2017 Australian urban planning and transport planning strategies still reflect the economic benefits of traditional motor vehicles (acknowledging the costs such as road deaths and hospitalisations) as modified by improvements in public transport.

The late 20<sup>th</sup> century saw the emergence of the service sector in Australia and despite the most significant mining boom in Australian history, the 21<sup>st</sup> century has confirmed pre-eminence of this trend driven by the fast growth in information and communications technologies, professional and scientific services.

*Source: Autropolis, The Diverse Mobility Revolution Page 27*

## CHAPTER 2: UNDERSTANDING THE AV PROBLEM

For AVs there are three stages in the cycle of innovation:

### 1. **Automated Driver Assistance Systems (ADAS)**

- ADAS are the foundation of AV technology and include Mobileye products such as lane departing warning, forward collision warning, speed limit sign recognition, radar / adaptive cruise control, self parking etc.

### 2. **Ride Hailing & Ride Sharing creating a critical mass and lowering transport costs for future Mobility as a Service platforms**

- The key to cost effective AVs is the introduction initially of driverless vehicles including ICE (internal Combustion Engine) and highly efficient EVs (Electric Vehicle). For example Uber is trialling driverless ICE taxi's in Pittsburgh to reduce mobility costs and increase profits
- Pooling share vehicles and potentially privately owned vehicles (Pre Mobility as a Service) as per Uber Pool to significantly reduce travel costs per kilometre and create initial price driven conditions where car ownership levels begin to reduce significantly due to improved service levels. Initially households will be more able to save costs by disposing of second and third vehicles as price competitiveness and availability of ride share and car share improves
- Pooling specific use vehicles e.g. The Tesla Tesloop service which provides share inter-city mobility services (e.g. Los Angeles to Las Vegas)
- Critical mass in demand for EVs generated by ride hailing and ride sharing which drives down EV capital costs and allows significantly lower operating costs to feedback to even higher demand for EVs and higher demand for mobility

### 3. **Driverless Automated Vehicle 'domination' of the car fleet. Full adoption of Mobility as a Service. This includes:**

- 'Back to base' technology for vehicles. This requires vehicles to be permitted to operate without an occupant
- Mobility as a Service dominating travel kilometres and AVs taking market share from public transport
- Individually owned vehicles owned in only around 30-40% of households (2011 / 90%) and the number of vehicles per household dropping from 1.6 per household (2011 / Capital Cities) to 1 per household in capital cities by 2035

From a technical perspective the classification systems developed by the American Society of Engineers (see levels of Automation) is adopted globally to establish a common language. This system establishes the first three levels in which the human driver monitors the environment and the second three levels where the vehicle monitors the environment. Driverless vehicles refer to Level 4

and to Level 5 (SAE Classification) automation. Level 5 refers to driverless vehicles with no requirement for a driver.

*Source: Autropolis, The Diverse Mobility Revolution Page 40*

### **CHAPTER 3: HOW AVs WILL TRANSFORM AUSTRALIA**

CAVs include private vehicles and trucks. There are significant efficiency gains desired due to 'platooning' or connecting trucks wirelessly (15% less fuel, significant reduction in drivers, maintenance and insurance estimated at over 50% for EVs). Tesla has announced it would launch an electric prime mover by September 2017. This has been followed by an announcement by Cummins that it will introduce a fully electrified powertrain for urban transportation in 2019 and extended range in 2020. The company indicated that electric powertrains for pickup and delivery would follow.

In relation to software and Artificial Intelligence, a raft of companies are investing heavily. This includes Google, Apple, Intel and Nvidia to name a few. Artificial Intelligence (AI) development is occurring across the spectrum due to its criticality in terms of real time decision making. The development of AI which is critical to AVs, is driving much broader outcomes in AI development because the complexity of AI required is significantly higher than the majority of AI applications. In 2016 the world's top ten carmakers submitted 9700 patent applications up 110% from 2012<sup>2</sup>. OEMs such as BMW, Mercedes Benz, Bosch and Mobility as a Service platforms are investing heavily in AI, so that CAVs can learn (from trials) and continue to learn, make good decisions and operate via simple yet efficient Human Machine Interfaces. Over time the AI will become valuable as the foundation for a wide range of applications.

#### **Mobility as a Service Platforms**

Mobility as a service platforms seek to provide complex multi modal mobility solutions for consumers. The concept of the 'platform' is to allow consumers to:

- Choose the type of route in terms of fastest, most environmentally friendly, most active, lowest cost etc
- Choose the preferred travel modes
- Pay 'as you go' or pay a monthly service fee

In its most simple form, the 'platform' can only work if:

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<sup>2</sup> *The Australian*, 20 September 2017

- Data and back of house real time transport information is not only available but can be shared
- Payment agreements with service providers can be struck and integrated payment systems can be operationalised

In terms of an overall policy framework the following chart prepared by Richard Harris (2017, HMI Technologies) identifies the key themes and inputs necessary to operationalise MaaS platforms. Conceptually MaaS is delivered as an app and mobility companion, tracking elements of the proposed journey and is also the payment system. In theory MaaS could deliver better service levels than a private car.

In Europe the MaaS Alliance, a public private partnership has been set up to create the foundations for a common approach to MaaS and to help unlock necessary economies of scale. Finnish firm MaaS Global has developed an app for Finland which includes payment of a flat fee for unlimited use of any public transport mode, including buses, trains, bicycles and a pre-set amount of taxi rides. The company has dubbed the concept the 'Netflix of Transportation'.

*Source: Autropolis, The Diverse Mobility Revolution Page 113*

## **CHAPTER 4: WHEN AVs WILL TRANSFORM AUSTRALIA**

The timing of AV take up depends on AV technology, regulation and consumer acceptance. As discussed AV technology will be trialled and operational by 2020 in Australia for Level 4 (designated roads) usage. This is relatively slow given that Level 4 AVs were legalised in Germany in 2017. This chapter reviews some of the regulatory issues including current legislation, insurance, cybersecurity and big data. This is followed by a review of current market research into AV consumer acceptance. Taking these factors into account and reviewing existing literature (including technology diffusion rates) guidance is offered into Level 4 and Level 5 AV introduction and timing in Australia.

*Source: Autropolis, The Diverse Mobility Revolution Page 119*

In Germany, current liability provisions exist, with the driver remaining liable unless drivers can establish lawful use of automated driving mode (the legislation requires AVs to include a black box to monitor the situation). While the legislation has been criticised for being vague it has been written to achieve national objectives in relation to maintaining the global competitiveness of the German automotive industry OEMs.

The UK on the other hand has not taken an OEM industry support approach. Rather, the Modern Transport Bill (2017), The Vehicle Technology and Aviation Bill (2017) and new

guidelines for AV cyber security seek to achieve the UK goal to be at the forefront of the international technology revolution, both in terms of developing driverless cars and launching a commercial space port. This Bill extends the motor insurance requirement to include automated vehicle owners, set standards for charge points, mandate provision of electric vehicle infrastructure and protect AVs from cyber terrorist attacks. The UK approach includes major public funding to put the UK at the forefront of autonomous and driverless vehicles usage and to develop the technology in the UK. The UK approach therefore focuses on accelerated AV take up as part of a broadly based economic development strategy.

*Source: Autropolis, The Diverse Mobility Revolution Page 128*