Submission

to the

Legislative Council Select Committee

on

Greater Hobart Traffic Congestion

by

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1. Introduction.

Urban travel is an activity undertaken by people only if the anticipated benefits of the activity outweigh its expected costs.
To the extent that benefits outweigh costs there is a net benefit to the individual that improves their welfare.
Individuals' net benefits aggregate to generate social and economic welfare to the community.

Urban land use structures are both a cause and an effect of changes in urban travel patterns. The location of land uses affects the costs of accessing them, and hence the viability of a particular urban land use depends on its accessibility to potential travellers and their desired activities.
While urban travel behaviours can change quickly, as the benefits and costs of travel change, urban land use structures show greater inertia and change slowly over time.

In this submission, using credible published data, I will describe how urban travel behaviour and land use structures have changed in recent decades and how these changes affect increasing levels of road traffic congestion in the Hobart urban area.

I will then argue the deficiencies of conventional urban planning paradigms in not recognising these important changes, and argue the need for a new planning paradigm that recognises the realities underlying Hobart's road congestion problems.

I conclude by describing the fundamental infrastructure and land use changes that need to be made to alleviate the increasing road traffic congestion in Hobart.

2. A changing society.

Urban travel behaviour and land use structures reflect the society in which they operate.

Since the end of World War 2 (WW2) society has been undergoing a major civilisation shift described as a transition from a declining industrial culture to an emerging post-industrial culture (Bell, 1973; Toffler, 1980).

Toffler adopts a "wave theory" of civilisation, with the post-industrial civilisation being the "third wave", following the "first wave" of the agricultural revolution some 10,000 years ago and the "second wave" of the industrial revolution from about 1750. Toffler describes the third wave transition as the emergence of a new civilisation whose dawn "… is the single most explosive fact of our lifetimes." (Toffler, p. 23).

Bell focuses on the shift from manufacturing to service sector employment, emphasising the importance of education, health and human services and the development of information through electronics and digital systems.

Although the post-industrial transition is most clearly identified with changes in employment it also brings with it changing family and social practices that lead to important alterations in urban travel behaviour and land use.

3. Employment change.

In the United States (US) manufacturing employment peaked as early as 1920 (Molitor, 1982). By 1950, employment in service sector industries exceeded employment in all other sectors combined.

In all employment sectors repetitive, routine workforce tasks have been displaced, and continue to be displaced, by automation and robotisation.

The dominant growth of service employment has been in professional occupations requiring tertiary education qualifications. Professional employment is referred to as the *quaternary* sector to differentiate it from the less skilled *tertiary* services sector, the *secondary* sector of manufacturing and allied industries and the *primary sector* of agriculture, forestry and fishing.

Service sector employment is gender neutral and the growth of the post-industrial society has been associated with a rapid increase in female employment, particularly the entry into the workforce of mothers with dependent children. Single women have always participated in the workforce, usually only until they dropped out due to marriage or becoming pregnant, either voluntarily and by government regulation. Women now have labour force participation rates equal to men with the majority of jobs in recent years going to women rather than men.

Service sector employment, being people-focussed, is associated with urbanisation. In 1950 only about 30% of the world's population of 2.6 billion lived in urban centres (that is, approximately 0.9 billion). By 2010 the proportion had reached 50% of the world's population of 7 billion (3.5 billion) and is expected to exceed 70% of the world population of 9.7 billion by about 2050 (approximately 6.8 billion people).

4. Land use structures and social changes (see Figure 1).

The *pre-industrial* city was small, compact and focussed about a central area comprising a market place, religious institution (church or mosque) and political buildings (palace, bureaucracy offices).
Transport consisted of human and animal power so movements were slow and time-consuming. As a result of the high friction of distance land uses grouped around the centre in a concentric pattern, a structure described by the American sociologist E. W. Burgess as the "concentric zone model" (see **Figure 1**).

The *industrial* city of the mid to late 19th Century was still focussed on a strong central area, the central business district (CBD), with a surrounding "zone in transition" occupied by factories and other industrial land uses.
The development of mechanical mass transit systems (train, tram and bus) radiating out from the CBD led to the creation of residential suburbs relatively far from the centre creating a star-shaped pattern described by another American sociologist, H. Hoyt, as a "sector model" (**Figure 1**).
Horse and cart and, later, flat tray lorries were the main modes of freight movement in urban areas, while public transport systems were the major passenger modes.

Radial, linear train and trams systems ferried large numbers of mainly male workers to and from the new suburbs and large centralised inner city workplaces, factories and offices.
The vast majority of married women stayed home to look after home and family while their husbands went to work as the family breadwinner.

The *post-industrial* city is dominated by motor vehicles as the principal mode of transport.
The widespread use of motor vehicles has allowed the urban area to expand far beyond the boundaries of the industrial city and to change its shape from star-shaped to areal-shaped.
The interstices between the old linear mass transit lines have been in-filled and the urban area continues to expand outwards.
While inertia ensures that the CBD remains as the main focus of land use, other sub-central nodes are becoming increasingly important to create what C. D. Harris and E. L. Ullman described as a multiple nuclei model (**Figure 1**).
Widespread truck use allowed manufacturing industries to move away from crowded inner city locations and to move to new industrial estates close to the periphery where they had ample space for operations and storage while still maintaining easy access to sea, rail and air terminals.
Retailing and office functions have also relocated to new suburban "regional shopping centres" where extra space allows them to be closer to customers and employees while offering the attractions of plentiful free parking.
The introduction of containerisation in the 1960s, together with the development of digital electronic communications, revolutionised the supply chain of freight movements.
The inter-modality of containers allows easy transfer between air, ship, rail and road modes. While air, ship and rail are used principally for line-haul operations between centres over large distances, trucks are used exclusively for short-haul functions in the urban tasks of consolidating smaller shipments from dispersed origins and distributing them to dispersed destinations.
Cars are vital for the increasingly complex set of daily activities undertaken by people in modern societies, where both men and women combine work duties with home and family responsibilities.
Economically, cars allow firms to select a workforce profile better suited to their corporate needs rather, than as before, having to take workers from nearby.
Employees, too, benefit by being able to choose jobs better suited to their skills and aspirations.
By recognising the opportunities to enter paid employment, young women are encouraged to pursue tertiary education in order to gain qualifications that would allow them to apply for professional careers in health, education, public service, finance and other post-industrial quaternary industries.
Opportunities to work in post-industrial employment have encouraged women to marry later and, with access to effective contraception, to have fewer children, resulting in a world-wide reduction in fertility which is leading to the stabilisation and ultimate decline of the global population.
Cars have been responsible for the three great social revolutions of the post-WW2 period.

First, the purchase of a family car enabled families to move away from the necessity to live either close to where the male household head worked or close to the flat corridors occupied by train and tram tracks and instead to relocate to more desirable residences on hillslopes, near beaches or bushland, and importantly at the urban periphery where land was cheaper and where they could afford to purchase larger houses on larger blocks of land.
Second, as car ownership became more universal, the second car enabled women with dependent children to enter the workforce in large numbers. Without access to their own private vehicle very few mothers would be able to combine working with their commitments to home and family.
Third, and more recently, cars are enabling the growing proportion of older people, as a result of increasing longevity, to lead more socially, physically and mentally stimulating lives. Opportunities to play sports, to visit friends and relatives, and to engage in a variety of cultural activities, contribute to the improved health of the elderly and help stave off age-related diseases.
Car ownership and use is compatible with the direction of social change which, like smart phones and other life-style commodities, is towards greater personal choice and autonomy.
Car use is at the control of the user who determines where and when to travel. Public transport, on the other hand, is controlled by remote third party administrators who determine not only routes and timetables but also other service variables such as fare structures, size and capacity of vehicles, comfort, and the configuration of seating, to suit their corporate goals. Rather than the system serving the passenger, the passenger is required to serve the system.
Universal car ownership in post-industrial societies has not only reduced the demand for public transport but has restructured urban land uses to create multi-nuclei low density areal spreading settlements making it difficult and uneconomic for public transport systems to serve.
In all major cities public transport's reduced role is now narrowly confined to trips to the central city and serving a declining proportion of central city workers who simply go to work until it is time to go home again.
The small proportion of citizens who for various reasons are unable to drive typically have travel demands that are off centre and off peak, therefore unsuited to public transport. Their specific needs are generally met by community transport, school buses and other means. The advent of autonomous vehicles will increase their options.

5. Post-industrialism in the Hobart urban area.

Note. In this submission the term "Hobart urban area" (HUA) is used to include the six municipalities of Brighton, Glenorchy, Hobart, Kingborough, Clarence and Sorell (defined by their current boundaries) as it permits convenient inter-Censal comparisons. The ABS prefers the term "Greater Hobart", representing the functional extent of the urban area, which unfortunately is subject to changing boundaries and therefore does not permit easy inter-Censal comparisons. At the 2016 Census, the Hobart urban area had a population of 218,290 compared with the Greater Hobart population of 222,356, a very small difference.

The Hobart urban area exhibits all the features of modern post-industrial cities, as do all other Australian capital cities and cities of comparable size.

Table 1 shows Censal levels of, and changes in, population from 1947, 1971 and 2016, and levels of, and changes in, employment and car ownership levels from 1971 and 2016 for each of the six Local Government Authorities (LGAs) of the HUA and for two groupings of LGAs, the "Core" consisting of the cities of Hobart and Glenorchy and the "Outer" ring of LGAs, Brighton, Kingborough, Clarence and Sorell.

Population levels and changes.

In 1947, when car ownership was low and few married women worked in paid employment, Hobart had almost two-thirds (64.1%) of the HUA population of 88,417. With Glenorchy added, the inner "Core" had 80.5% of the HUA population with the "Outer" ring suburbs contributing only 19.5%.

By the 1971 Census, when household motor vehicle ownership was first included in the Census count, Hobart city's population had decreased to 52,426, slightly more than one third (34.8%) of the HUA total, which had increased by 62,438 to 150,855. Glenorchy's population meanwhile had increased to 42,651, mainly due to car owning families escaping the flat low lying corridors of the train and tram tracks and moving to the elevated slopes of Springfield, West Moonah, Montrose and Rosetta.
The "Outer" ring LGAs, predominantly Clarence, also increased substantially to 55,778, or 37.0% of the HUA total.
Clarence's huge relative growth in this period was mainly due to opening up residentially attractive eastern shore suburbs following completion of the Tasman Bridge in 1964.

By 2016, Hobart city's population had decreased further to 50,439, representing just 23.1%, less than a quarter of the HUA total, which had increased to 218,290.
The "Outer" ring suburbs, due to substantial growth in car ownership and the opening of the Southern Outlet and the construction of the Transit Hub at Brighton, has more than doubled its population to 121,598, outstripping the inner "Core" population of 96,692.

In the almost half-century between the 1971 and 2016 Censuses, the HUA population increased by 67,435.
Remarkably, and significantly for Hobart's road traffic congestion, almost all of that growth (97.6%) was attracted to the "Outer" ring suburbs in the north (Brighton), south (Kingborough) and east (Clarence and Sorell) with 21.0%, 36.7% and 39.9% of the growth respectively.

Employment levels and change in the HUA.

In 1971 the of the total labour force (TLF) of 60,658, men outnumbered women by a ratio of 2 to 1, with 67.1% and 32.9% of the TLF respectively.

By 2016 women had reached almost parity with men, with 49.4% (51,415) of the TLF of 103,978.

Between 1971 and 2016, of the 43,320 increase in the TLF, women accounted for 72.6% (31,459) compared with only 27.4% (11,861) for men.

Motor vehicle ownership levels and change in the HUA.

In 1971 19.7% of HUA households had no registered motor vehicles, while 29.1% had two or more motor vehicles. The majority of households, 51.2% had just a single registered motor vehicle.

By 2016 the percentage of households with no motor vehicle had fallen to only 8.1%, while those with just 1 motor vehicle fell to 38.0%. The majority of households in the HUA (53.9%) had two or more registered motor vehicles.

The increase of households in the HUA between 1971 and 2016 was 39,127. Of these, 80.7% had multiple registered vehicles.

The above statistics clearly reveal the remarkable changes that have taken place among the six LGAs of the HUA, particularly in the past half century.
There has been a massive redistribution of population from the inner "Core" LGAs of Hobart and Glenorchy, from the Taroona boundary to Granton and from the Derwent River to kunanyi/Mount Wellington, to the "Outer" ring of suburbs in Brighton, Kingborough, Clarence and Sorell LGAs, especially in the south-western suburbs of Kingborough and the south-eastern suburbs of Clarence and Sorell.
Growth in female employment, principally of women with dependent children, has outstripped growth in male employment by a factor of almost 3 to 1.
Car ownership has multiplied greatly with multiple car households replacing single car households. Individual adult car ownership has replaced the family car.

The above three key indicators show Hobart is exhibiting the typical post-industrial transition towards (a) a preference for low density residential development in outer suburbs, (b) the growth of gender-neutral quaternary sector employment and (c) the universality of car ownership and use for daily activity patterns.

Hobart is not alone in these traits. In the decade between 2001 and 2011, outer city areas accounted for 46% of Sydney's population growth, 53% of Brisbane's, 62% of Melbourne's and 68% of Perth's growth (BITRE, 2014).

6. Consequences for Hobart's road traffic congestion.

Rapid population growth in the outer suburbs of the HUA, predominantly in the south-western suburbs of Kingborough and the south-eastern suburbs of Clarence and Sorell, trends expected to continue into the future, will mean increased traffic on the three dominant arterial roads connecting those regions with the rest of Hobart, the Southern Outlet from Kingborough, the Tasman Highway from Clarence and Sorell, and the Brooker Avenue from Brighton and Glenorchy.

All three regional arterials funnel traffic onto the twin one-way arterials of Macquarie and Davey Streets traversing the central area of Hobart city.
The cross-arterial streets from Regent/Antill Street to Campbell Street also feed traffic onto Macquarie/Davey from the southern suburbs of Taroona, Sandy Bay, Mount Nelson and Dynnyrne and from the northern suburbs of West Hobart, North Hobart, New Town and Lenah Valley.

Hobart is the only capital city in Australia where the entire central street system is used to collect, distribute and convey road traffic; traffic that is trying to either access the CBD or trying to bypass the centre to reach other destinations.

While traffic trying to access the CBD may decline due to road congestion, traffic trying to bypass the CBD will inevitably increase as population growth, and hence total road traffic volumes between the regions, increases.

The use of the inner city streets to traffic results in considerable disamenity to pedestrians and businesses within the central area, creates a barrier between the central area and the beautiful waterfront of Sullivans Cove and causes damage to Hobart's collection of colonial buildings, the best in Australia, especially to those lining the intended grand boulevards of Macquarie and Davey Streets.

7. The failure of the conventional planning paradigm.

Since the 1960s, when increasing road traffic congestion started to become a problem, urban planners (and the planning industry generally, including engineers and architects) have adopted the dominant paradigm of getting people out of cars and back onto public (mass) transport.

In the 1970s when the policy failed to achieve intended results the dominant paradigm adopted the policy of redesigning cities to become a set of urban villages aligned to public transport corridors to encourage public transport use and make it unnecessary for people to use cars.

Urban villages, it was argued, would be mostly self-sufficient and make cross-town trips redundant. The policy of land use change was known as "transit supportive development (TSD)", later changed to "transit oriented development (TOD)".

The dominant paradigm has become virtually an ideological creed for students studying for degrees and careers in planning, engineering and architecture.

Cars were, and still are, accused of creating urban "sprawl", of consuming valuable agricultural land at the urban periphery (land adjacent to the periphery is valuable because of its proximity to the urban market; market gardening and dairying surround all cities regardless of environmental conditions), and of causing a multitude of social and environmental dysbenefits. The meaningless catchcry "planning for people not cars" implies that cars have a mind of their own and act autonomously.

Motorists were, and still are, accused of being lazy, selfish, and environmental vandals. The use of cars is blamed for creating a world epidemic of obesity, ignoring changes in diets and other factors. Self-selecting samples of people changing their commuting habits by riding bicycles or taking public transport rather than driving their cars to and from work are used fallaciously to "prove" that public transport users are somehow " physically fitter" than car users.

Such studies, based on the assumption that the only physical activity engaged in by commuters is the amount of walking they do going to and from work, neglect other

areas of physical activity. For example, they overlook that the greater savings in time to car users compared with public transport users allows the former group more time to spend on physical exercises, such as taking the dog for a walk, gardening, having a game of tennis, squash or golf with colleagues after work, or going for a jog.

To my knowledge there are no credible published randomised controlled trials (RCTs) anywhere in the literature that objectively compare the fitness levels in general of car users with those of public transport users.

The planning methodology disaggregates the complex array of urban travel into sets of separate trips, independently described as trips to various land uses (work, shop, school, home, etc) each with their own time-space characteristics and mode of travel. Such methodology ignores that increasingly, busy urbanites engage in daily journeys of linked trips to spatially separated land uses at various critical times during the day.

Most people, before they close their eyes to go to sleep at the end of the day mentally run through the activities they need and want to do the following day and how those activities can be fitted into the time available. If any one of the links in the chain requires the use of a car then the car has to be with you for the whole journey.

This explains why “park and ride” schemes are not used by most commuters. Commuters know they have things to do either on the way to work, during work hours or after work, such as taking children to school, attending to personal business matters, visiting old friends for a social call, or taking the kids to ballet or soccer.

It also explains why “car-pooling”, another proposal with a long history of failure, doesn’t work. In post-industrial societies people no longer work near people they live near, nor do they live near people they work with.

Planners frequently talk about the “end of the road” for cars. In the 1990s it was fashionable to speak of “peak oil” causing an end to car use. In the 2000s, as car use reached near saturation levels in the USA and more teenagers stayed home while completing their college degrees, it became fashionable to talk of “peak cars” and the end of “car dependence” (see for example, the ABC *The Science Show* interview between Robin Williams and Professor Peter Newman).

On the advice of planners governments have published numerous planning documents promoting the dominant paradigm, as well as pouring massive subsidies into projects to improve public transport systems and to encourage high density consolidation of population into inner city areas.

Car use is actively discouraged by high fuel excise duties, high vehicle registration costs, restrictions to parking, and reducing available road space by extensions to footpaths and the introduction of dedicated bicycle and bus lanes.

Despite all this effort, nowhere in any city in any country has the dominant paradigm achieved its fundamental objectives of reducing the extent of continuing low density settlements or of reducing the growth of car ownership and use.

In the USA, despite billions of dollars of federal, State and local government investment since the 1980s to create 1,000 km of modern light rail in 16 regions the principal objectives of arresting the decline of city centres and increasing the use of public transport have not been realised (Freemark, 2014).

As **Figure 2** shows, across all Australian capital cities the mode split between public transport use and car use for urban travel has not significantly changed for the past four decades (when personal automobility became almost universal), with the share remaining at around 10% for public transport and greater than 80% for private vehicles.

Globally, car ownership and use continues to increase. In 1970 worldwide car registrations totalled 193 million. By 2000 they had risen to 549 million and by 2015 to 1.1 billion. By 2025 worldwide car registrations are expected to surpass 2 billion. (Davis, et al. 2016).

Planners ignore the changing nature of society as described earlier in this submission. Rather than trying to understand the changing daily activity patterns that lead to urban travel, they focus exclusively of the manifestations of those motivations, that is, the traffic generated and the physical infrastructure side of roads, train lines, tram and bus routes and the vehicles on them.

This emphasis leads them to compare, for example, the carrying capacity of a bus with a car, and to falsely assume that a bus, or other mass transport vehicle, could replace a quantity of cars in the system.

There is a well-known diagram of a section of roadway packed with cars and replica diagrams showing how the occupants of those cars could be accommodated into a much smaller number of buses or a single tramcar or train carriage. The impression given is that substituting mass transit vehicles for personal cars would result in a substantial saving of road space.

The argument is spurious. The occupants of the cars are each coming from separate origins and heading to separate destinations. Their arrival at that particular section of road at that particular time is purely coincidental.

Nor does the argument consider that each motorist has a set of unique activities to do that day that differ from the activities of motorists in other cars.

A further point is that the flow of traffic of cars (allowing for traffic lights and other impediments) is continuous, while the movement of mass transit vehicles is intermittent, dependent on timetables. Due to the intermittency of frequency a light rail system, for example, has only 20% of the carrying capacity of a single two-way freeway and only half that of an urban arterial (Public Purpose, 1996).

8. Environmental issues, low density settlement and car use.

A common theme among planners and supporters of the dominant planning paradigm is that low density settlement and car use are bad for the environment.

Low density settlement, it is argued, stretches the supply of essential services such as water, sewerage, and electricity, thereby adding to financial and environmental costs.

The system whereby households depend on large centralised, usually publicly owned, utilities to supply them with electricity, water, and sewage disposal, was part of the declining industrial age culture (see Toffler, 1980, Chapter 4).

Post-industrial culture is more towards small scale self-sufficiency. Given encouragement by authorities it is not difficult to visualise a future in which low density households satisfy their own on-site independent needs for electricity (as is already popular with roof-top solar panels), their own collection and recycling of water, and their own disposal of wastes including human sewage.

Low density single family dwellings make it easier for this transition to occur. Large suburban house plots allow room for gardens, backyards for children to play, roof area for solar panels and space for off-street parking. High density high-rise apartments, on the other hand, do not offer these amenities on site and will always be dependent of remote third party authorities to provide essential services.

Car use is opposed by environmentalists for many things, most notably air pollution by carbon dioxide emissions, but also for the waste of resources building roads and other facilities.

The advent of electric vehicles, powered by batteries capable of being re-charged overnight at home, will reduce the need for fossil fuels required by the internal combustion engine. Electric vehicles may be part of an innovative development of personal automobiles that could include hydrogen and fuel cell powered engines.

Cars are relatively light weight vehicles and are amenable to such transformations, unlike much heavier public transport modes, such as heavy rail suburban train services, or light rail trams, of large buses, which will be more difficult to convert to self-contained power sources and will always need the external supply of highly concentrated energy to move them.

9. The need for a new paradigm for urban transport and land use planning.

The above discussion points to the need for a new urban planning paradigm that recognises the following fundamental realities based on the emerging post-industrial culture:

(a) an acceptance that universal personal automobility, especially the use of a private motor car, is here to stay and will remain the dominant mode of urban travel,

(b) an acceptance that low density suburban residential settlement is the preferred option for most families, notwithstanding the preference for a minority of the population to live at higher densities in the central urban area. The latter group includes young single adults and many elderly persons who have low space needs and who value proximity to the services and amenities of the inner city,

(c) an acceptance that the structure of urban areas no longer consists of a dominant central business district acting as a focus for concentric and

(d) sectoral arrangements of land uses, but that motor vehicle use has resulted in an areal spread land use structure arranged around multiple nuclei, and, an acceptance that public transport's role is a diminishing one in the mix of urban travel behaviour and is not an adequate substitute for personal mobility.

The new planning paradigm would encourage the dispersal of jobs and traffic from peak hour flows to the central city by promoting flexible working hours, working from home, and the decentralisation of jobs that do not need to be centrally located.

It would advocate the need to increase the overall amount of road space to give people more options in planning their daily activities.

10. What to do about Hobart's road traffic congestion (some suggestions).

(a) Adopt the new planning paradigm, as described above. Governments and planners must realise that personal automobility, like mobile phones and social media, is here to stay and society will not return to the "second wave" characteristics of the industrial past, whether in living arrangements or modes of travel.

(b) Accept that increases in the types of public transport and their levels of service will have very little impact on reducing the volume of road traffic. Public transport systems are necessarily limited to routes and timetables and therefore are unable to adequately serve the increasingly spatially dispersed and time constrained activities of people in post-industrial societies. Only personal transport modes, especially cars, are able to go anywhere at anytime and hence serve the areal and temporally dispersed patterns of post-industrial activities.
Within the Hobart urban area, public transport use accounts for only 3.5% of the total motorised transport task (**Figure 3**).
Introducing ferries on the Derwent or a light rail system through the northern suburbs is unlikely to have any significant impact in reducing car use. If introduced, ferry and rail passengers are more likely to be attracted from current bus services.

(c) Given the continuing growth of population in the outer suburbs and the need for people to connect with the whole of the Hobart urban area, connecting the three major arterials of the Southern Outlet, Brooker Avenue and Tasman Highway is not only an urgently needed infrastructure project, but is inevitable to avoid future major congestion issues in central Hobart.

(c) Retired Hydro engineer and project manager, Tony Denne, has proposed an acceptable and viable engineering solution to the problem of connecting the three major arterials via a western bypass around the Hobart CBD.
I fully support his proposal and understand that it has been independently submitted to this Committee.
The western bypass project would take considerable through traffic away from Macquarie and Davey Streets and improve the amenity of Hobart by allowing better connectivity between the city and the waterfront and by better protecting Hobart's collection of colonial architecture.
Commercial businesses within the CBD would benefit by reducing the volume of traffic using city streets and facilitating more pedestrian activity.

The western bypass project should be funded partly by Federal and State governments in recognition of the considerable public good associated with it, and by motorists' personal willingness to pay (by electronic e-tags) for a reliable uninterrupted and time-saving diversion around the Hobart CBD.

(d) The Tasman Bridge is nearing capacity and will be under more pressure as population growth continues in the Clarence and Sorell municipalities. To the extent that a proportion of the traffic is flowing between the eastern and northern suburbs an arterial link should be constructed between Mornington and Geilston Bay to connect with the East Derwent Highway and the underutilised Bowen Bridge.

(e) The Southern Outlet has very few intersections and is therefore subject to long queues of congested traffic in the event of a major disruption. Traffic can extend for its entire length with no opportunity for motorists other than to stay with their stationary vehicles. Links between the inward and outward sections of the highway should be constructed to allow traffic to reverse and find alternative routes. Links need to be constructed between the Albion Heights turn-off and the Olinda Grove intersection and between the Olinda Grove intersection and Davey Street.

(f) Land uses need to be encouraged to move out of the Hobart CBD to other sub-nodes with the Hobart urban area. Many lower level public service jobs, for example, could be moved closer to where people live to reduce the need for commuting into the centre. More encouragement of flexible working hours and working from home are other options.

11. Conclusion.

I congratulate the Legislative Council for establishing this Select Committee to investigate this important issue, and thank the Committee for the privilege of making this Submission.

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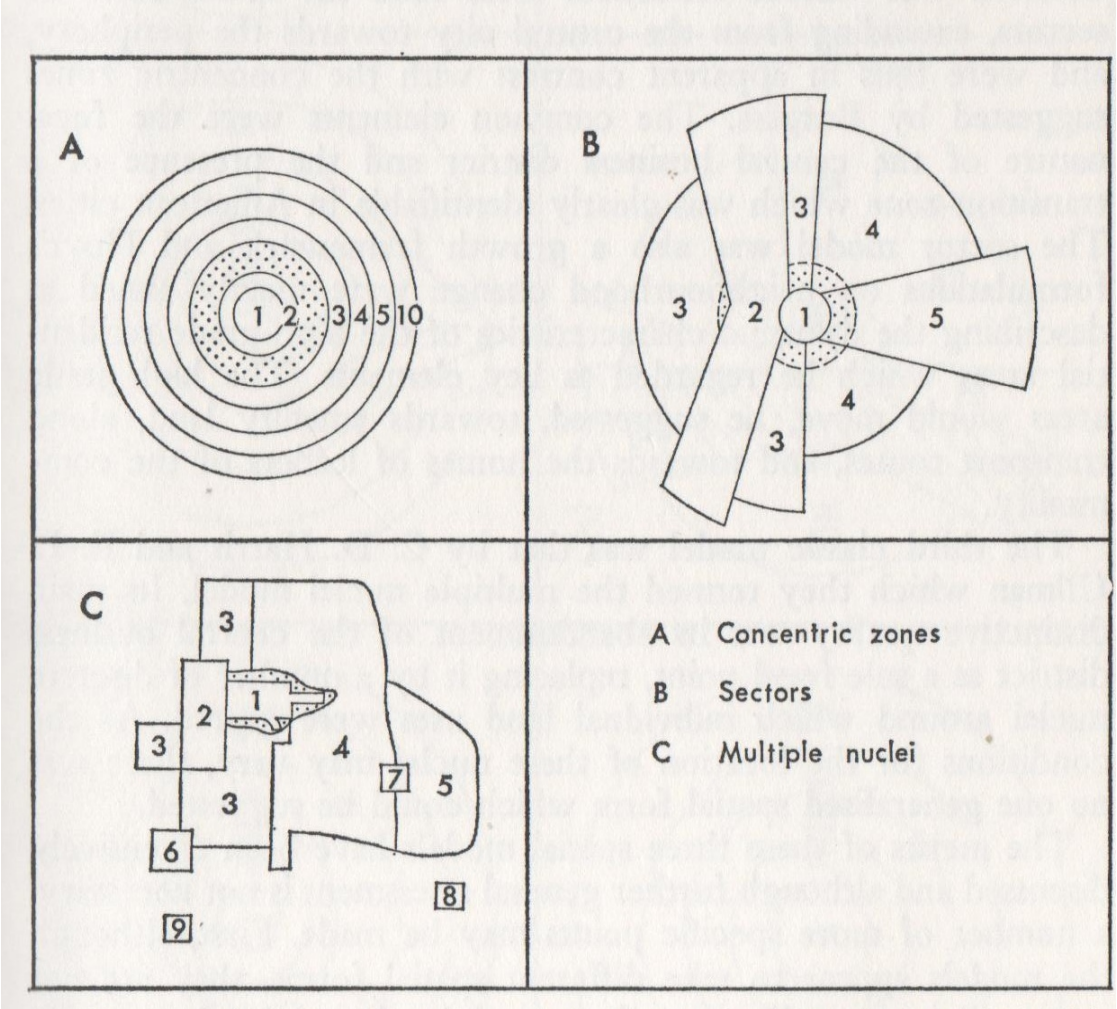


Figure 1. Classic models of urban structure.
[Source: Herbert, D. 1972. *Urban Geography: A social perspective* (David & Charles, p. 71]

Note: The concentric zone model approximates the urban structure of the pre-industrial city, the sector model that of the industrial city, and the multiple nuclei model that of the post-industrial city.
The diagrams are not to scale. The pre-industrial city was small and compact, the industrial city expanded along the radial linear mass transit lines, while the post-industrial city is huge in comparison with an areal stretching of population and land uses.

Population, Labour Force and Motor Vehicle Ownership
Hobart Urban Area (HUA) and LGAs, 1947, 1971 and 2016.

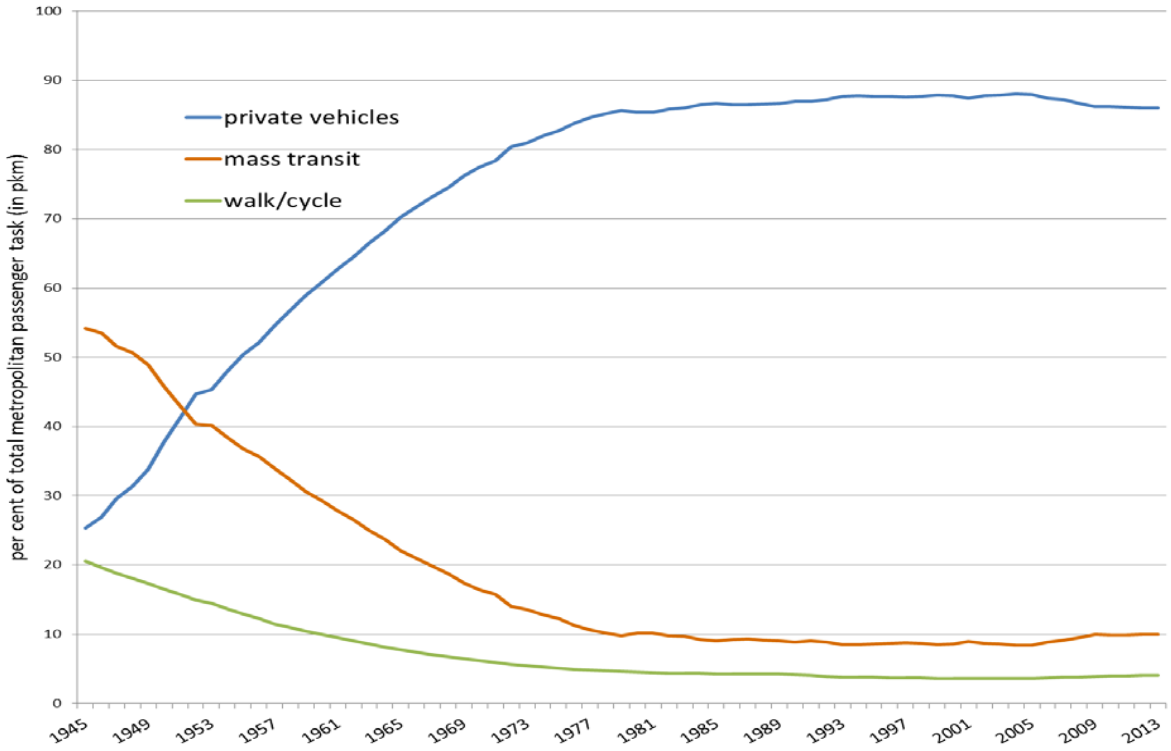
	1947 Census		1971 Census		2016 Census		Increase	*'71-'16*
LGA	**Pop'n**	***% HUA***	**Pop'n**	***% HUA***	**Pop'n**	***% HUA***	**Pop'n**	***% HUA***
Hobart	**56,640**	*64.1*	**52,426**	*34.8*	**50,439**	*23.1*	**- 1,987**	*- 2.9*
Glenorchy	**14,493**	*16.4*	**42,651**	*28.3*	**46,253**	*21.2*	**3,602**	*5.3*
Brighton	**1,839**	*2.1*	**2,333**	*1.5*	**16,512**	*7.6*	**14,179**	*21.0*
Kingboro	**6,543**	*7.4*	**11,126**	*7.4*	**35,853**	*16.4*	**24,727**	*36.7*
Clarence	**6,822**	*7.7*	**38,683**	*25.6*	**54,819**	*25.1*	**16,136**	*23.9*
Sorell	**2,080**	*2.4*	**3,636**	*2.4*	**14,414**	*6.6*	**10,778**	*16.0*
HUA (H+G+B+ K+C+S)	**88,417**	***100.0***	**150,855**	***100.0***	**218,290**	***100.0***	**67,435**	***100.0***
Core (H+G)	**71,133**	*80.5*	**95,077**	*63.0*	**96,692**	*44.3*	**1,615**	*2.4*
Outer (B+K+C+S)	**17,284**	*19.5*	**55,778**	*37.0*	**121,598**	*55.7*	**65,820**	*97.6*

Labour Force (HUA)	**1971**	***%TLF***	**2016**	***% TLF***	**'71-'16**	***% TLF***
Male Labour Force	**40,702**	*67.1*	**52,563**	*50.6*	**11,861**	*27.4*
Female Labour Force	**19,956**	*32.9*	**51,415**	*49.4*	**31,459**	*72.6*
Total Labour Force	**60,658**	***100.0***	**103,978**	***100.0***	**43,320**	***100.0***

Motor Vehicles per HHD (HUA)	***1971***	***% HHDs***	**2016**	***% HHDs***	**Increase '71'16**	***% HHDs***
0 Motor Vehicles	*8,323*	*19.7*	6,615	*8.1*	- 1,708	*- 4.4*
1 Motor Vehicle	*21,621*	*51.2*	30,888	*38.0*	9,267	*23.7*
2 or more Motor Vehicles	*12,300*	*29.1*	43,868	*53.9*	31,568	*80.7*
Total Households (HHDs)	***42,244***	***100.0***	**81,371**	***100.0***	**39,127**	***100.0***

(ABS Census 1947, 1971 and 2016)

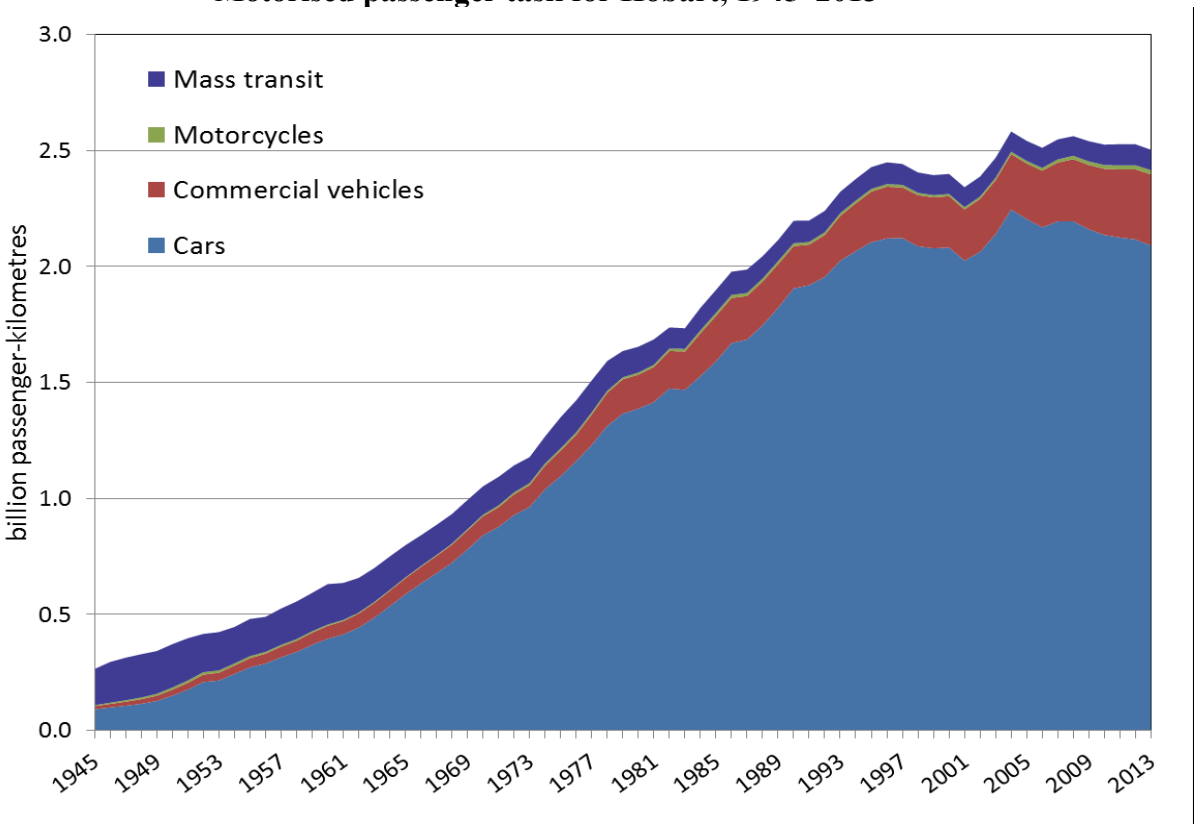
Table 1.
Aggregate modal shares for passenger task within Australian capital cities, 1945–2013.



BITRE, 2014. Urban public transport. Information Sheet 59, Canberra, p. 4.

Figure 2.

Motorised passenger task for Hobart, 1945–2013



BITRE, 2014, Urban public transport. Information Sheet 59, Canberra, p. 26.

Figure 3.