## **COMMUTER CAR PARKING IN NEW SOUTH WALES**

Organisation:

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To: Legislative Assembly Committee on Transport and Infrastructure From: Professor David Levinson, University of Sydney, School of Civil Engineering Re: Commuter car parking

It is my pleasure to provide information to the New South Wales Parliament's Committee on Transport and Infrastructure regarding Commuter Car Parking. I am Foundation Professor in Transport Engineering at the University of Sydney, with more than 25 years experience in the field in the United States. While I cannot comment on individual car parks or their location, as the appropriate designs are usually context-specific, I can provide some general background and ways of thinking about the question.

The problem of commuter car parking is more generally the problem of accessing public transport stations, sometimes referred to as the "last mile" or "first and last mile" problem. While having fast, direct, frequent, and reliable public transport service is important, being able to get to that service is also critical. The travel times involved in accessing transit stations at either end are often as long as the time spent moving aboard the transit vehicle.

There are a variety of means that can be used to access public transport service, including walk, bike (including both traditional privately owned bikes and electric bikes (e-bikes) and bikes from newer bike-sharing and e-bike sharing systems), taxi (including ride-hailing like Uber), other public transport (like local bus or multi-party ride sharing vehicle), as a car passenger ('Kiss and Ride'), or as a car driver (park-and-ride). (One can imagine other modes as well (e.g. car-sharing (like GoGet or CarNextDoor, but those are usually less practical). The best choice varies by individual and location, and most public transport stations will have a mix of arrival modes.



Historically, dating from the age of trams and stream railways, public transport was accessed primarily on foot. For this reason tram lines were spaced closely together (say every half-mile (or 800m)) so that walking to stops was convenient. Older suburbs in cities like Sydney developed around this transport mode, and had the residential population density to support frequent public transport service by tram, train, and later bus. Walk had and continues to have numerous advantages over other access modes, as it is low cost and has no environmental externalities.

## Location efficiency (land use) with Walk and Bike Access

In a transit-based city, public transport and land use have historically evolved together, and new transit lines should be complemented with appropriate land development (and vice versa). Everyone in such places everyone can walk to public transport.

From a cost per commuter perspective, walk and bike are the least expensive modes, both for the traveler and for society as a whole. The advantage of bikes over walking is their larger catchment area. Biking (at 20 km/h) allows coverage of about 16 times the area of walking (at 5 km/h). This implies significantly more customers in the same amount of time, and should be strongly encouraged. The disadvantage is that bikes are sightlier costlier than walk as a mode to support, as bikes will require secure parking and safe access paths (walking of course requires sidewalks, which generally already exist, unlike separated bike lanes in NSW), as well as a supportive rather than hostile public policy environment. Nevertheless, the cost of bike storage is significantly lower than the cost of park-and-ride for automobiles. The Dutch are the world's experts at bicycle transport and bike-and-ride, and many lessons about how best to do this can be learned by studying practice in the Netherlands.

Another cost-effective way to increase the catchment area of public transport is to construct entrances at each end of the station. Long platforms take nearly 2 minutes to traverse, so travellers who live, say, south of a station with an entrance at the north end may need to walk the length of the platform before entering the station, and then, depending on the preferred car to optimise their exit, may need to walk back again (an extra four minutes), which could be reduced with a second platform entrance. (They may need to walk another 2 minutes depending on their final destination vis-a-vis the exit at their destination station.) This could be repeated on the evening commute, resulting in up to 12 minutes of lost time per day because of inconvenient entrances and exits.

Stationless bikesharing is becoming hugely popular in China, and Reddy-Go has introduced the service to Sydney. The advantage of such a system is that bikes will be located near frequent origins and destinations, and tend to cluster at stations. By encouraging bike access or egress, they make transit more desirable as a mode for more people. Storage areas for shared bikes need to be set aside, clearly designated, and enforced should this become popular in order to ensure these bikes do not interfere with pedestrian access.

## Pick-up and Drop-off.

The earliest pick-up and drop-off at transit stations date from the earliest days of the motorcar and suburban railway stations, have evolved into what are referred to as "kiss-and-ride", whereby the driver (typically a spouse, parent, or child) drops off their family member at a transit station, and then proceed onto their final destination (after exchanging

affections). (The mirror trip is logistically more complex and includes pick-ups in the evening, before returning home). This is more efficient than park-and-ride as it avoids the need for parking at the station, and the costs of an extra vehicle for the household. While the multi-car family has resulted in this type of trip becoming less popular, saving time for the traveler chauffeuring the passenger at the cost of higher parking and car ownership costs, this type of trip may see an upsurge. The advent of app-summoned taxis and their equivalent (Uber, Lyft, and so on) can provide access to or egress from transit stations, complementing transit service. Lyft, the main US competitor to Uber, reports that transit stops are their most popular category of destination. While this is an added cost, more expensive than walking, biking, or well-used buses, one can imagine with the emergence of autonomous vehicles the costs will drop and this will become more popular, especially in lower density suburban areas.

## Park-and-Ride

Newer suburbs developed in the age of the automobile, and while many have grown to include train and bus services, the car is a far more dominant mode in these areas in terms of market share, and transit access is more difficult on foot because of the greater spacing between stations and lines and lower density of residential development. In these areas park-and-ride lots (commuter car parks) have been constructed.

The advantage of commuter car parks lies in basic geometry. It takes about 28 square meters to store a parked car on a surface lot (including access lanes, etc.), or about 360 cars/hectare. For a fully occupied 1 hectare lot, if every one of those parked cars carried 1 person, that produces 360 public transport boardings from that station in the morning (and 360 boardings elsewhere in the evening, assuming symmetry). That hectare generates 720 daily public transport trips.

In contrast, let's say we had zero commuter car park spaces, and those car users could not otherwise access the station because of distance and lack of other access modes. Instead we had transit-oriented development. Let's further assume that adjacent land uses have a 50% public transport mode share for work trips and 0% for non-work trips. We would need 720 resident workers on that hectare to have a similar number of public transport trips generated. Since only half the population works, we are looking at 1440 total persons on that ha of land to generate as many trips as transit oriented development. The point is not that anyone should (or shouldn't) build a structure with a 1 ha footprint housing 1440 people, just that park-and-ride generates a large number of riders that cannot be easily made up with low-density transit-oriented development.

Low, or even medium, density residential development around the station will not enable as many public transport users as the park-and-ride lot. Now that doesn't mean it is costeffective to build a park-and-ride lot, which depends on the value of land, on maintenance costs, whether park-and-ride spaces are given away for free or can be charged for, and levels of demand. It certainly doesn't mean it is cost-effective to construct a parking structure, which cost on the order of \$50,000 per space (amortised that is about \$5000 per space per year, or \$20 per space per work day)

Even after accounting for construction, surface parking lots are far from cost-free, maintenance costs are surprisingly high: in Minnesota, a 288-stall lot generated \$AU 43,000 per year in maintenance costs which amounts to a subsidy of at least \$AU 147 per parked car per year. (Divide by occupancy, the share of spaces used daily, for the actual subsidy, which is higher), or at least \$AU 0.58 per day per car. While most of Australia can avoid the snow plowing costs of Minnesota, lighting and other maintenance issues remain.

If the charge for car parks were free, this adds to the cross-subsidy from people who walk to public transport to people who drive to public transport. To speed revenue collection, parking should be paid for with Opal cards. The rate should be set separately for each lot as costs, demands, and conditions vary.

As the market evolves over time, surface park-and-ride lots can be thought of as a land bank, which can be developed at higher intensities when conditions warrant. The simplest way to ensure land is developed to the highest and best use, be that park-and-ride surface lots, structured parking, or more intensive land development is to place it in the hands of organisations with the right incentives. This may require allowing the transit service provider to develop land adjacent to and above (and below) stations. Land value capture techniques (like the land value tax and joint development, among others) can be used to ensure that the transit system benefits from the land value uplift created by transit services.

Trains running alongside freeways and freeway express/bus rapid transit lanes are especially appropriate for park-and-ride, as the drivers converging on downtown can be persuaded to divert to transit upstream of the city and avoid downtown parking costs (and the resulting congestion between their diversion point and the city).