IPART
New South Wales

Independent Pricing and Regulatory Tribunal

External benefits and costs

Final Report – Information Paper 7

Introduction

The marginal external costs and benefits of each mode of public transport (externalities) are key inputs to our fare optimisation model.

We have previously assessed the externalities associated with public transport use. Our December 2014 Draft Report[1] explained our in-house model we developed to estimate these externalities, and presented preliminary estimates.

As part of this review of Opal fares, we updated the model and some of its inputs. We also did more analysis and considered stakeholder comments on some of the externalities.

The following slides set out our final decisions on externalities that we used in making our final decisions

1 IPART *Draft Report, Review of External Benefits of Public Transport*, December 2014

Externalities of public transport

Externalities are the costs and benefits to third parties that are not reflected in the price of travel, and therefore not accounted for when people decide how they will travel (their mode of travel).

Using public transport does not always create a net external benefit. It depends on how the external costs/benefits of using the chosen public transport mode compare with the external costs/benefits of the alternative modes:

- Car travel has larger external costs than any public transport mode, so there is always a net external benefit when people use public transport if they would otherwise have driven
- However, walking and cycling have larger external benefits that any public transport mode, so there is no net external benefit when people use public transport if they would otherwise have walked or cycled.

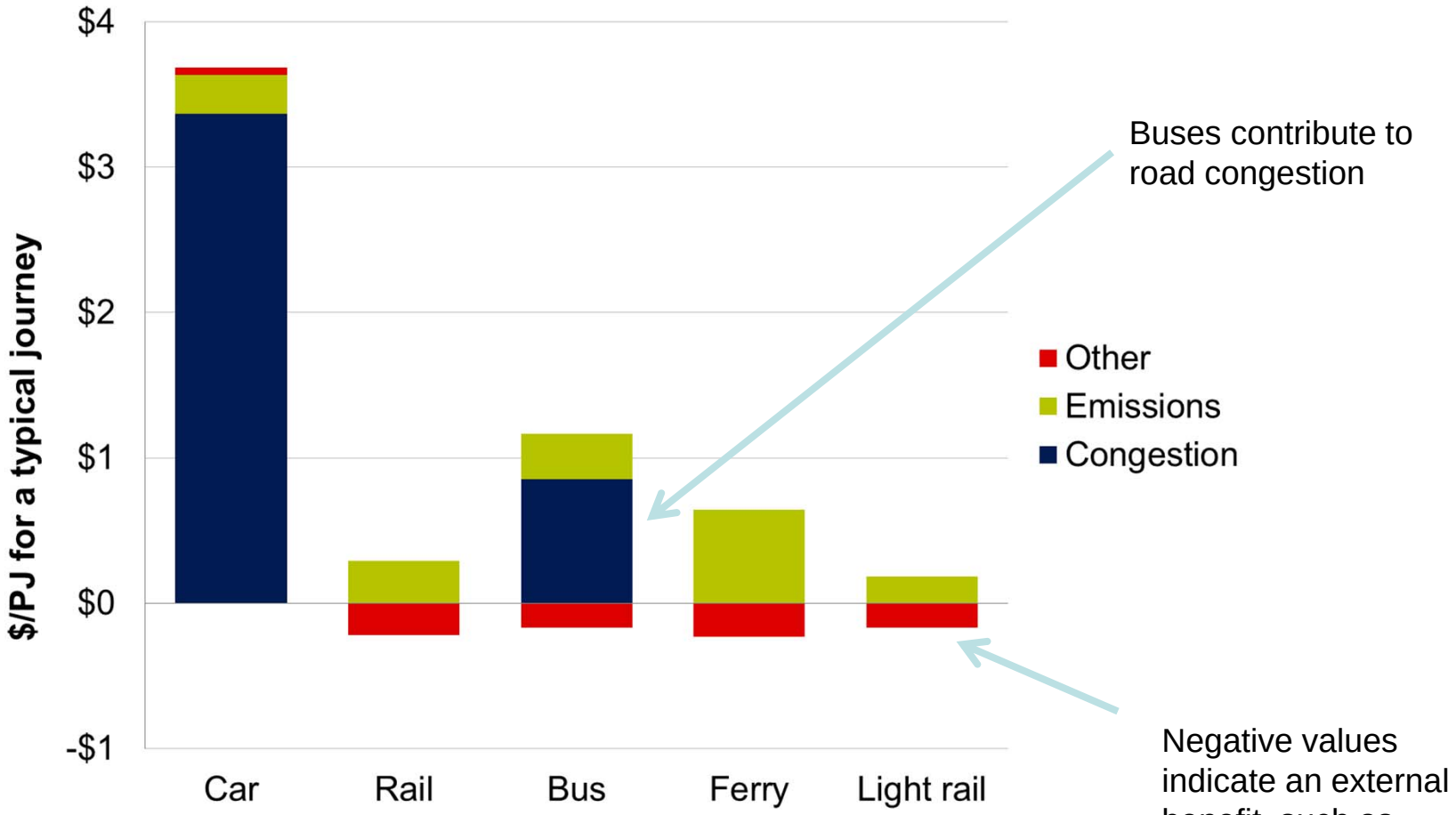
The 'external benefit' of a public transport journey reflects the net avoided external cost of car use. It depends on:

- The marginal external cost/benefit of travelling by public transport
- The likelihood that a car journey is avoided when a public transport journey is taken (known as the modal substitution factor.)
- The marginal external cost they would have imposed if they had travelled by car instead.

External benefits of public transport included in our estimates

External benefits	How we estimated this
Congestion: avoided traffic congestion when someone uses public transport instead of driving	• Time – the value of time saved by existing drivers • Vehicle operating cost – the value of fuel and other vehicle operating costs avoided by existing drivers • Reliability – the value of more predictable travel times for existing drivers
Emissions: avoided environmental costs when someone uses public transport instead of driving	• Value of avoided air pollution • Value of avoided greenhouse gas emissions
Accidents: avoided costs associated with road accidents when someone uses public transport instead of driving	• Value of avoided cost of taxpayer funded services • Value of avoided uninsured fatality costs of non-car occupants (pedestrians and cyclists)
Active transport: health benefits when someone walks or cycles to or from public transport	• Value of avoided health system cost savings
Service frequency: the benefit of additional services being added as more people use public transport (the Mohring effect)	• Value of time saved by existing public transport users due to increased service frequency

External costs of public transport for a typical journey by mode



Note: The service frequency benefits have been excluded from this chart

Our final decision on marginal external costs – excluding frequency benefits

- We have calculated separate estimates for peak and off-peak travel.
- We have also estimated which externalities result from the number of passenger journeys (PJ) or vary by distance travelled (pkm)
- We used these estimates in calculate socially optimal fares.

		Rail	Bus	Ferry	Light rail	Car
Marginal external cost peak	$/passenger trip	-0.22	0.68	-0.23	-0.17	3.09
	$/pkm	0.02	0.16	0.13	0.04	0.51
Marginal external cost off-peak	$/passenger trip	-0.22	0.06	-0.23	-0.17	0.71
	$/pkm	0.02	0.09	0.13	0.04	0.20

Negative values indicate a net benefit, for example, from active transport.
These figures exclude the marginal excess burden of taxation, as our optimisation model includes these separately.

Our final decision on marginal external costs and benefits – including frequency benefits

		Rail	Bus	Ferry	Light rail	Car
Marginal external cost peak	$/passenger trip	-0.22	-0.49	-1.41	-1.34	3.09
	$/pkm	0.02	0.05	0.02	-0.07	0.51
Marginal external cost off-peak	$/passenger trip	-0.22	0.06	-0.23	-0.17	0.71
	$/pkm	0.02	0.09	0.13	0.04	0.20

These figures exclude the marginal excess burden of taxation, as our optimisation model includes these separately.

Submissions on our draft report and our response

- Some submissions stated that we had ignored certain types of external benefits of public transport, such as avoided carbon emissions, avoided accident costs and health benefits from active transport. Our estimates however do include these costs and benefits.

- One submitter (G. Harman) indicated that the time cost of congestion was not an externality. This submitter further stated that the motorist causing this problem also experiences travel delays -it is not an externality. Our analysis found that the additional travel time imposed on other motorists by one motorist's decision to drive instead of travel by public transport is an external costs of driving. The marginal motorist internalises part of the congestion cost they cause, but most of this delay is imposed on others. Our estimates of the external congestion cost distinguishes between these private costs and external costs and counts only the external costs.

Submissions on our draft report and our response

Several submissions (eg, NCOSS, CPSA, the Older Women's Network, Council on the Ageing) argued that social inclusion is an externality that should be taken into account in our fare proposals. These organisations noted the following benefits of mobility/social inclusion:

- improved health and mental health
- increased employment participation
- broader participation in education
- community engagement
- participation in volunteering activities and unpaid caring work.

Many of the benefits of social inclusion are largely private benefits to the individuals. We consider that there is a policy argument for providing concessions to customer groups, such as economically disadvantaged people, who are at higher risk of social exclusion. We also note that the risk of social exclusion and the cost of accident externalities increase with age, independent of economic disadvantage. We consider that these are justifications for concession fares.

Our final estimates of externalities

Our final estimates of externalities include:

- Updated data on number of peak passenger journeys for light rail.
- Updated bus congestion car equivalents – our draft report used a value of 3 car equivalents. TfNSW guidelines recommend a value of 3 for 3 axle buses and 2 for 2 axle buses. As the metropolitan bus fleet is largely made up of 2 axle buses, we have used a value of 2 for the final report – consistent with the TfNSW guidelines
- Updated data on bus utilisation rates

Externalities differ for peak and off-peak

- Traffic congestion is worse in the peak than in off-peak periods, so peak car journeys have higher external costs per vehicle-kilometre. Peak public transport journeys therefore create a larger external benefit than off-peak journeys when they displace car trips.
- Emissions per kilometre travelled are roughly the same in peak and off-peak periods, unless traffic is slow enough to increase fuel consumption markedly. Peak gridlock can contribute to excessive emissions.
- There is a relationship between traffic speed (slow in peak, faster in off-peak) and accident costs. In heavy traffic, accidents are more likely, but generally less serious.
- Service frequency benefits are also likely to be different between peak and off-peak.
- Active transport benefits are comparable in peak and off-peak periods.

Our model allocates the estimated externalities between PJ and pkm

- We updated our model to: (1) calculate separate peak and off-peak values for each external cost, and (2) allocate these values to passenger journeys or passenger km for each mode. Our fare optimisation model requires these inputs.
- Some externalities depend on the distance a passenger travels, others depend only on the number of journeys. Some depend partly on each.
- For some externalities, the allocation is straightforward. For example:
  - Emissions depend on distance travelled, so 100% is allocated to pkm
  - Active transport depends on number of journeys, so 100% is allocated to PJ.
- The congestion allocation depends on where and when the avoided car travel occurs:
  - If congestion is in a particular location, the number of cars entering the bottleneck drives the external cost, not the distance they travelled
  - If congestion is widespread, distance travelled drives the external cost.

  We have assumed a 50% allocation to PJ and a 50% to pkm.

Allocation of marginal external costs/benefits between PJ and pkm

	Passenger journeys	Passenger kms
Congestion (time)	50%	50%
Congestion (reliability)	50%	50%
Congestion (vehicle operating costs)	50%	50%
Emissions	0%	100%
Accidents	0%	100%
Active transport	100%	0%
Service frequency benefits	50%	50%

Our model separates modal substitution factors and marginal externalities

- We separately identify the:
  - marginal external costs/benefits of each mode of transport (including car travel)
  - modal substitution factors (the rate at which people switch between different modes of transport)
  - excess burden of taxation associated with subsidising public transport.
- Our 2014 externality estimates combined these into a single external benefit estimate for a trip on each mode of public transport.
- To estimate optimal fares in our final report we separately identifies the marginal external costs/benefits and the modal substitution factors.