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To: Infrastructure Victoria Date: 15th February 2017

Re: **TCPA's response to the first draft research & policy paper 'The Road Ahead' for transport network pricing by Infrastructure Victoria**

Please find on the following pages our submission in response to Infrastructure Victoria's invitation to the public to make comments about its first draft research and policy paper titled 'The Road Ahead'.

Yours faithfully

Peter Hill,

Honorary Secretary,

Town and Country Planning Association

Town and Country Planning Association response to the Infrastructure Victoria paper 'The Road Ahead'

Contents

ASSESSMENT OF THE ISSUES RAISED IN THE IV STRATEGY PAPER

We are in general agreement with the comments by Infrastructure Victoria ("IV") in its **Summary** (pp.6 & 7). We note IV's view that road pricing (a state prerogative) should complement federal road pricing ("RP") programs. We agree that state and federal RP should be complementary, however the difficulty is in getting the right integrated formula. We demur from IV's focus only on non-freight road traffic pricing. Urban freight traffic is not insignificant, especially in and near freight ports (i.e. intermodal transfer points – road-marine, road-air, road-rail, air-road, air-rail) and concentrations of road warehousing (road-road vehicle transfers).

We raise the issue that public transport ("PT") and rail pricing strategies should be cognizant of and integrated with RP. The balance between RP and public transport user-pays pricing (the trip fares or "PTP") needs careful strategic thinking. To the extent that road-users pay more than the "direct" costs, i.e. the full recovery of total infrastructure, operational and maintenance costs of road, i.e. pay for road-traffic-generated external costs, which include health impacts, and PT users "underpay" the direct costs of PT, will need careful and very detailed analysis and design.

"Property-accessibility" value-capture taxation: the IV policy research paper contains no reference to "betterment" or "value capture" taxation from what we call "non-user beneficiaries", i.e. those property-holders or occupiers who obtain enhanced capital gains or business profitability from the heavy investment in roads or public transport to which their

properties have high-quality user-access. As a source of revenue to fund the transport networks (road and PT), we think transport-related value-capture or betterment levies must be integrated into the road pricing equation. Inner city property levies were a major funding mechanism for the Melbourne Underground Loop.

Road pricing should not be an additional tax. We strongly agree with IV (p.7) here. There is much scope to replace fixed road-use charges (vehicle registration and trauma insurance funding (TAC in Victoria) with travel-related charging. The revenue stream from federal excise on refined fuels faces downward pressure with the prospect of substitution by electric vehicles, thus a move away from fuel-consumption taxing towards travel-related charging has merit, even with a component for carbon-emissions charging through fuel excise. As IV correctly observes, petroleum fuels excise is not hypothecated to funding the Australian road transport networks.

RP revenue should be re-invested into the operation, maintenance and construction of the transport network: roads, on-road and rail PT, and non-motorised transport ("NMT", i.e. cycling and walking) infrastructure (IV, p.7). We strongly agree with full hypothecation of the revenue into these networks and into funding of human injury trauma treatment (currently met by TAC).

Adequate public transport is in place first. "Road pricing should work if there are transport choices which support people shifting to public transport or taking alternative routes. This cannot be achieved without adequate public transport infrastructure and services in place first." (IV, p.7).
Whilst it is a truism that adequate PT must be available for RP to succeed in driving modal shift away from cars to PT, in the major transition programs of road pricing and PT expansion, there would necessarily be some synchronization of these two. Why? Because the sheer scope of financial outlays to build and operate the expanding PT services will require part of the RP revenues to finance PT, and to provide financial incentives for travelers to use PT.

We also see the opportunity for part of the RP revenue paid by each motorist to be credited to that motorist's RP account as a credit redeemable upon usage of that person's PT automated fare payment account (currently Myki in Victoria) for PT travel. Refer to our description of (dynamic) wide-area road pricing concept ("WARP" or "DWARP") further on p.8.

About IV's viewpoint on p.10: *"The main objective of a transport pricing regime should be to manage demand rather than recover costs. This will inform how a pricing regime is designed and set."*
We disagree with the IV position, and note that it at least partially contradicts IV's stated support for returning RP revenue to the road transport system to fund its development and operation (ref. IV, p.7). Cost recovery, demand management and financing trauma recovery are the comparable main priorities of transport pricing regime. We believe, *a priori*, that RP and PTP user-pays revenues should be 100% returned to the financing of road, NMT and PT systems expenditures, even if the chosen policy settings do not require user-pays pricing revenues to provide 100% of all investment and operating costs. If RP is effective as a demand management tool then the need for road network expansion is reduced and the revenue can be skewed towards expanding the capacity of the PT and NMT alternatives.

IV p.14, 15 & 16: supported, with the reservation that the complementarity of federal and state RP should not project state RP upon general traffic as a subordinate "follower" strategy to federal RP on heavy vehicles. IV's statement of intent (p.15) to include PT user-pays pricing (fare restructurings) and integrate this with RP is supported in principle. Note that we do not

advocate that a PT fare system would recover the full cost of providing the PT services.

Unfairness and inefficiency of current financing and pricing mechanisms of road- and PT usage (IV pp. 18-22) – the dilemma of the "public good":
We agree with the comments made by IV. A fundamental issue is in the traditional policy and public expectation that the road and PT systems are "public goods", which they *should* be, rather than privately controlled and regulated assets, which was common in parts of Europe and North America up to the 18th century (thus, the origin of the term "turnpike"). The dilemma of the "public good" policy is that unhindered access is a corollary of a government-provided public good, yet such unhindered access leads to inappropriate and excessive use, thus congestion. A challenge in developing transport system pricing models is how to balance efficiency with universal opportunity of access (a criterion of a public good).

[A definition: In economics, a *public good* is a product (or service) that one individual can consume without reducing its availability to another individual, and from which no one is excluded. Economists refer to *public goods* as "non-rivalrous" and "non-excludable."]

Of course, PT is far from being a true public good, due to its very uneven geographic access. Yet it is treated as a public good and subsidized accordingly. Obviously, the concept of a "public good" is not identical to the virtue of that commodity or service. IV correctly identifies the lack of universal reliable and regular access to PT by residents in outer suburbs and non-metropolitan regions.

In light of the lack of fairness in accessibility and the coinciding free-rider gains by those with access to good PT, we assert that the argument for an "accessible" and "efficient" transport systems pricing model that encompasses road users, PT users and property owners, addresses and compensates for such inequalities is very pertinent.

What is the congestion problem?

(IV, chapter 4, pp.24-31)

Definition of congestion: The IV paper lacks clear quantitative definitions of traffic congestion, and any discussion of criteria of public acceptability vs. unacceptability of degrees of congestion (p. 23 onwards). IV has referenced Victoria Transport Policy Institute's TDM encyclopedia at http://www.vtpi.org/tdm/

What research-based policy settings can or should be put in place to decide trade-offs between pricing measures vs. infrastructure $ investment vs. acceptability of some measures of congestion? An aside: transport congestion in a region can also be a measure of that region's socio-economic success! We believe this aside is pertinent in assessing a weakness in geographic-cordon congestion pricing, and the potential for counterproductive outcomes of congestion pricing in promoting dispersal of population and economic activity to less-dense regions. For examples, peri-urbanisation, etc.

The congestion problem is complex. Whereas most of the transport literature commentary considers traffic and transport congestion to be a transport problem, it is also a consequence of the quantity and spatial distribution of correlating land uses (including the home).

We suspect that road pricing has to include both factors of discouragement (e.g. pricing to deflect congestive levels of roads onto PT and active transport modes) and factors of attraction,

that is, where to encourage land uses to gravitate towards. Deflecting strategy alone could cause dispersal of land uses into regions ill-served by trunk rail or other supply infrastructure such as water and energy conduits. The dual components of strategy could be considered as "carrot and stick".

Obviously transport pricing cannot act alone as a successful "gravitator", but would need to complement deterministic land-use zoning for re-gravitating land-uses towards districts that can be readily connected by PT and roads and other supply infrastructure.

We are in general agreement with the observations and commentary by IV in projecting the problems of road and PT service congestion (assuming the continuation of established transport technologies) in the future timeframe to 2046 (IV pp. 24-31).

How can Melbourne address the congestion problem?

(IV, chapter 5, pp.32-37)

We view IV's central argument (a) that building more infrastructural capacity without any pricing deterrent (as the main method of travel demand management ("TDM")) will induce more demand for travel as misunderstanding the causes of travel. Transport – the movement of people or goods – is a *derived* demand or activity which is undertaken to achieve other (transcending) aims which can be described as activities or material needs-satisfaction which are geographically-based. That is, we move ourselves or freight from one place to another to satisfy some need or aim.

An alternative interpretation (b) of what is referred to as additional travel "induced" by extra transport service "capacity" which improves the level (quantity) or quality of transport service (transport "LoS" or "QoS"), is that the increase in transport "capacity" meets unmet demand for travel to achieve desired land-based activity goals.

We believe that both (a) and (b) interpretations of travel demand are valid explanations of the quantity of travel made, with (b) being preponderant.

Transport and land-use planning policy should seek least-cost (or lesser-cost) optimal outcomes of mixes of transport modal shares and land-use structures. We agree that IV is heading broadly in the right strategic direction in its development of a roads-, thence transport systems pricing strategy. We broadly agree with IV in its view (IV, p.37) that transport pricing can effectively manage demand.

A challenge for strategic planning of transport is to explore other interactive factors which determine transport demand, e.g. land-use structuring, density and co-location of activities, and communications technology to substitute for some of the land-based activities that generate travel, e.g. tele-commuting, and home-based shopping and work.

Road pricing benefits and limitations

(IV, chapter 6, pp.38-43)

Social impacts should be managed fairly yet efficaciously (IV, p.38). We stress that RP should comprehend the different levels of affordability of travel (whether by road or PT) for people

on low incomes compared to higher incomes. RP, without some socio-economic transfer mechanisms, will favour travel by richer people, simply in light of their greater ability to pay. (IV, p.42: refers to this).

Potential for distorting impacts of cordon-entry or fixed-area pricing upon geographically-based businesses:

Wikipedia quotes the following (as at January 2017) regarding the London cordon boundary pricing system: "The effect of the congestion charge zone on local businesses is a contested issue. The TfL estimates that the effect on business has been overall neutral. However, the effect on business differs significantly between stores. Some shops and businesses are reported to be heavily affected by the charge, both in terms of lost sales due to reduced traffic and increased delivery costs, as recognised by the London Chamber of Commerce….."

For this and other reasons, we favour a dynamic wide-area / whole-of-network continuous pricing system (hence "DWARP"), instead of a point- or boundary-crossing ("PBC") price charging system (such as cordon, tollgate or toll gantry-point systems). See p.8 of this submission.

Managing the impact of driverless cars (IV, p.41):

IV is right in addressing the effect of driverless cars (or autonomous vehicles ("AV") upon traffic patterns (IV, pp.36, 39 and 41). We believe that the large-scale uptake of AV transport technology has the potential to unleash strategically discontinuous change-trends to road traffic patterns that have been observed and modelled over much of the preceding century. Thus, research and modelling of traveler behaviours and decision-making warrants a top priority by governments and the private sector.

UITP's strategic assessment of autonomous vehicles

The Brussels-based International Union for Public Transport (UITP) recently released an excellent strategy/policy analysis '*Autonomous vehicles: a potential game changer for urban mobility*' (UITP, 2017) about the prospects of AV technology and its impact on transportation. We recommend that IV assess this document (see References) and any background research in its compilation. We support the strategic findings by the UITP and believe that these trends will become relevant in the strategic design of an effective RP for Victoria.

Some imaginative speculation about the impacts of AV vehicles: -

a) Analysis of AVs journeys will require extra terminology. For freight vehicles, the present dichotomy between "laden" vs "un-laden" trips or movements will be complemented by "empty vehicle" trips, i.e. when a freight vehicle moves without either freight or people on board. For passenger vehicles, whether private cars, taxis (or their equivalents) or other road-based PT vehicles, the "empty vehicle" classification of trips will be added.

b) Passenger AVs will enable more distance to be driven without increasing personal time commitments. Only the direct material costs of the vehicle travel (petrol, pro-rata

maintenance) will be incurred. These direct distance costs are much less than commercial or metered public parking fees, PT fares, taxis or Uber-type services. For example, commuters could be driven to work in their AVs, then program their AVs to return home or else to some selected on-street parking space until required to return to pick up the same commuters for the return trip, or else pick up other passengers in informal car-share arrangements. There would be a significant increase in traffic during and next to the conventional commuting peak times. There could be a loss of patronage carried by conventional taxis and pay-for-ride service such as Uber.

c) Reduced demand for end-of-passenger-trip parking: A consequence of (b) could be increased car travel thence reduced PT travel to inner city areas and other intensive activity centres, if the current lack of supply and cost of parking can be avoided by commuters who would decide to dispatch their empty cars to car parks distant from their personal trip-ends. A knock-on consequence could be increased use of free, time-unrestricted on-street parking in districts closer to such activity centres. Also, the high-capacity commercial carpark operators could lose much business.

d) A further consequence of (b) could also be an increase in travel by radial rail services, once the barrier of rail commuter off-street parking congestion could be avoided by parking AVs in unregulated kerb-sides in remote streets. This would result in increased remote AV parking in predominantly residential streets.

e) Surprisingly, even in spite of (d), the economic justification for expanding free off-street parking for rail commuters will likely worsen even further. The direct and indirect return on investment in commuter parking is much less than the alternative of current feeder bus routes, and the prospect of lower-cost demand-responsive transit (DRT), say, on a continuous multi-hire or "flexi-bus" platforms, utilising small driverless buses, will render any economic recovery of sunk costs in rail commuter parking unachievable.

f) The is likely to be major loss of jobs from commercial road transport and PT as robotics in AVs displace manually-driven vehicles

Road pricing models and mechanisms

(IV, chapter 7, pp.44-51)

IV's three principles for inspiring and assessing candidate designs of a RP system for Victoria are supported. These principles are Efficiency, Fairness, and Sustainability and simplicity.

IV's eight draft criteria are:

1. Economic efficiency

2. Beneficiary alignment

   We recommend that the application criterion be extended to incorporate, where relevant, the complementation of travel-movement pricing with value-capture taxation or levies from non-user beneficiaries of program-induced increases in property values. A question: would or should the "flipside" also apply, i.e. where transport infrastructure building and RP-induced changes in commercial activity create the legal grounds for

compensation of disaffected private parties?

3. Fairness

   We would expand this heading to read as "fairness and equity". This could provide consistency with the principles of equity already enshrined in the Transport Integration Act (Victoria, 2010) ("TIA 2010")

4. Environmental impacts

5. Other infrastructure impacts

6. Land use impacts

7. Revenue potential and funding sustainability

8. Simplicity

We suggest that IV consider two additional assessment criteria: -

9. Defensibility

   Consideration must be given, when formulating an RP model, to the legal precedents it might create or else breach upon its inauguration thence implementation of subsequent changes, and the risk of application of estoppel in litigation by other parties.

10. Strategic risk and redundancy

    Consideration must be given, when developing an RP model, to the capacity for making practical changes to that RP system during its lifetime of operation. We invoke the concepts of Igor Ansoff's strategic-environment "turbulence" model and conceptual matrices (Ansoff & Sullivan, 1993), and the strategic methodologies evolving from Michael Porter's 5-Forces model (Wikipedia, 2017). For example, SWOT analyses will be one of the essential methods of research.

    For example, coping with the threats associated with technological change, or else the opportunity to evolve the RP system to exploit further technological advances. Consider, for example, the risk of technical obsolescence in the Victorian myki card and card reader infrastructure and software in the face of new cellphone payment platform apps.

    Another example is the major improvement in vehicle GPS technology, both in its cheapness and its locational precision in recent years. GPS technology opens the door to robust and comprehensive dynamic whole-of-network RP, whereas over a decade ago, gantry or pavement detector point-detection technology was the only practical option for RP operations.

    The potentially discontinuous, even surprising levels of change to transport systems posed by AVs (TCPA, p.5 above, and IV, pp.36, 39 & 41) is another example of the top priority of continuous strategic forecasting in developing transport pricing systems that are highly adaptable to change.

Dynamic Wide Area Road Pricing ("DWARP")

From the preceding, there are multiple issues inherent in transport resourcing and impacts, and we have cross-related them to 4 headings, according to their predominant aims. The issues include:

- investment costs,
- operating costs,
- externalities generated,
- value of non-user benefits not contributed to PT provision,
- land use impacts
- inequitable access and asymmetrical social benefit (inner urban areas vs other regions),
- motorists' aversion to payment of RP,
- increased PT provision, and thus public budgetary costs,
- Overcoming the inherent unattractiveness of PT travel versus private motoring within most regions
- Increased uncertainty and unpredictability of transport technology and people's preferences (e.g. AVs, switch to EVs),

And their relation to major objectives of an RP program:

Issues	Cost recovery	Equity & fairness	Sustain-ability	Road user behaviour change
investment costs	✓		✓	
operating costs	✓		✓	
externalities generated	✓		✓	
value of non-user benefits not contributed to PT provision	✓	✓		
inequitable access and asymmetrical social benefit (inner urban areas vs other regions		✓		
land use impacts	✓	✓	✓	✓
motorists' aversion to payment of RP				✓
increased PT provision, and thus public budget costs	✓		✓	
Overcoming the inherent unattractiveness of PT travel versus private motoring within most regions				✓
Increased uncertainty and unpredictability of transport technology and people's preferences (e.g. AVs, EVs)			✓	✓

In light of these, we advocate an RP model that can fulfill the objectives and needs to satisfy these issues. Let's call this *Dynamic Wide-Area Road Pricing*. We envisage an RP system that would incorporate effectively all of the attributes of coverage (4 pricing models) and 4 mechanisms summarized in IV's very informative Table 4 on p.47, with its defining emphasis as a dynamic whole-of-network system. The algorithm would consist of several or many mathematical functions which together would add up and/or multiply together to yield the RP

paid by that vehicle's controller for a particular trip.

We envisage that a DWARP system would operate across all or much of Victoria, probably with many of its demand management functions operating at low intensity levels. For example, RP charging to encourage modal shift to PT would not work within most of regional Victoria as there are very few high-quality PT services! A state-wide coverage could provide an interface with future analogous RP systems in NSW or South Australia.

Within the foreseeable future, the in-vehicle RP GPS and vehicle ID technology would be cheap and easy to install into vehicles, whether retro-fitted into already-registered vehicles or into vehicles produced after DWARP's start-up. Installation and registration of the in-vehicle units would be compulsory for renewal of vehicle registration. Once the entire fleet is fitted, DWARP charging program could start.

We illustrate below the major, but not all of the component functionalities of DWARP (and not alternative RP models as such), and the reasons for them:

Vehicle ID definition and registered uses: Mass, energy propulsion type, energy consumption/distance rating. Required for pricing of emissions, wheel load upon road pavement, comprehension of trip purpose, thence modal substitutability.

Latitude and longitude position of vehicle via GPS: locating the vehicle for application of appropriate RP charging rate in estimation of local congestion, and other position-specific charging components.

Distance-related: proxy for emissions released (energy cost is privately paid), road space occupied per trip (thus infrastructure space taken). Measured from GPS tracking.

Time-related: a component variable (timing of trip or vehicle movement) as a proxy for determining the charge rate according to congestion conditions measured against clock time and calendar.

Premium-priced lanes: We recommend that DWARP include this functionality, as it would enable more efficient utilization of traffic lanes on the arterial road network, assuring high QoS movements of PT, emergency services and other preferred vehicles, whilst gaining traffic utilization of the valuable infrastructure. Bus-only lanes, where, say, there is a bus every 5 minutes or so a waste of infrastructure. The pricing algorithm would dynamically determine the price according to experienced demand levels and a system of space auctioning by aspiring premium-lane users. The premium lane-access price, thus algorithmically determined, thence advertised, would assure the desired high QoS of traffic movement.

Corridor-related: Behavioural modal shift to PT ("MSPT") could also be encouraged by dynamically setting differing distance X time-of-day charge rates according to the orientation of a particular vehicle trip with respect to the "degree of ease" of substitution of that trip's origin-destination ("O-D") geography by available PT service(s). A set of "modal substitutability" coefficients ("MSC") could be set up, ranging from zero (0%, for no substitute PT) up to 1 (100%: the car trip fully substituted by proximate PT). A research-based $ rate (or rates) (likely to be based on distance) would be set up to provide behavioural incentive to switch from car travel, and this would be multiplied by the applicable MSC. For example, a commuter chooses to drive on a weekday from his Brighton Beach home (say, some 400 metres walk from Brighton Beach station) to a car park in Melbourne's CBD where he works. This trip is fully substitutable by train travel, thence walk (or a short tram trip). The RP algorithm would

calculate the applicable charge rate (function of distance/km, calendar time and geographic congestion) distance and congestion level) then multiply this by a MSC of, say, 1. Part or all of the revenue from this MSPT component of RP should be credited as a "loyalty credit" to one or more PT fare payment account(s) (e.g. myki) pre-designated by the vehicle owner, say in the name of that driver/commuter, thus further encouraging modal shift. Thus, the MSPT RP surcharge and the PT loyalty credit would function as "stick and carrot" incentives.

Trip purpose: A complex issue, requiring much research to produce an RP design that would be efficacious and not meet with widespread public objection. We will only illustrate the importance of trip purpose in designing DWARP in light of the broad goals of RP. In shifting travel from private vehicle to PT or NMT ("active transport"), many vehicle trips simply cannot be substituted, thus behavioural change components of a DWARP should not be applied to them. Dedicated freight trucking is obvious.

For example, light commercial vehicle trips for transporting materials (or services), such as tradespeople, parcel couriers, cleaners, franchisee dog-groomers and gardeners, etc. As the requirements of end-of-trip activities render these trips not substitutable by PT, could these trips be distinguished from purely passenger trips by their timing and positional movement patterns? Also, could these vehicle operators apply for certain DWARP certificate classifications that would exempt them from MSPT behavioural charging?

Another example might be paramedical and homecare (e.g. RDNS Australia) vehicle operations. Would emergency vehicles would be exempt from most components of a DWARP or RP?

Parking behaviours:

Complex and perhaps difficult to forecast into the longer-term future, given the prospective roll-out of large fleets of AVs. Behavioural changes could be surprising (Ansoff context).

The need for policy-makers to modify or change vehicle parking behaviours depends on the following:

- Is there a localized excess parking demand for available public spaces, and if so, what are the reasonable priorities (social and economic utility or disutility) for allocating access to (use of) available spaces?
- What is the economic cost to the public purse of providing parking spaces, or of alternative facilities for trips serviced (e.g. by switching to PT or NMT modes)?
- Given that parking is part of the vehicle journey, consideration of the economic and social utility (or disutility) of each vehicle road trip thus facilitated

We recommend that a DWARP system incorporate public parking supply and pricing strategies for completeness of pricing the vehicle trip, given that vehicle parking is part of the vehicle journey, and the potentially surprising trend changes resulting from switching to AVs. Obviously, this will require coordination and integration of state government and municipal parking management strategies.

GLOSSARY OF ABBREVIATIONS USED

AV	autonomous vehicle, i.e. driverless vehicle
CBD	central business district
DWARP	dynamic wide area road pricing (or WARP wide area road pricing)
EV	electric vehicle
GPS	global positioning system
IV	Infrastructure Victoria
LoS	level (quantity) of transport service
MSC	modal shift coefficient
MSPT	modal shift to public transport
NMT	non-motorised transport (active transport, such as cycling and walking)
PBC	point- or boundary crossing
PTP	public transport pricing
QoS	quality of transport service
RDNS	Royal District Nursing Service
RP	road pricing
SWOT	strengths, weaknesses, opportunities and threats (used in strategy analysis)
TAC	Transport Accident Commission of Victoria
TDM	travel demand management
TfL	Transport for London
UITP	International Union for Public Transport

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