The Planning and Funding of Road Infrastructure via PPPs

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Abstract: The shortfall in the funding for construction, operation and maintenance of road infrastructure in Australia is substantial and future investment appears to be beyond the capabilities of government funding alone. In the past, the private sector has proven very willing to invest in PPPs with government to provide road infrastructure and, overall, its performance in relation to construction, operation and maintenance has been far superior to that of government and has relieved government of substantial risk. However, it is unlikely that the private sector will accept the same levels of risk on new PPPs as in the past.

Key words: Roads; Infrastructure; Contract procurement; Public Private Partnerships.

I. Introduction

The shortfall in the funding for construction, operation and maintenance of road infrastructure in Australia is substantial and future investment appears to be beyond the capabilities of government funding alone. In the past, the private sector has proven very willing to invest in Public Private Partnerships (PPPs) with government for the provision of road infrastructure and, overall, its performance in relation to construction, operation and maintenance has been superior to that of government and has relieved government of substantial risk. However, it is likely that the private sector will not accept the same levels of risk on greenfield PPPs as they have in the past. This paper:

- provides a picture of past performance and risk management of Australian road PPPs;
- investigates barriers that exist for efficient future procurement (including the allocation of risk);
- attempts to look afresh at the purpose of urban and inter-urban motorways and congestion and questions whether patchwork tolling exacerbates the problem; and
- considers a number of PPP models and makes some recommendations relevant to future procurement.

II. Historical Summary

In the early days of road construction in Australia, tollroads, toll ferries and toll bridges were the norm, largely funded by private enterprise. This changed completely during the last century with the rise of the State-owned road agencies who eventually took control of almost all road

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transport. Roads, bridges and ferries became regarded by the public as “free”, which really meant paid for out of taxes.

The 1970’s saw governments becoming aware that the growing demand for road funding was competing with other government priorities (in particular, health and education) and, at the same time, the growth of cities was placing greater pressure on road systems. This led to the introduction of user-funded PPPs, starting with the Sydney Harbour Tunnel, followed closely by the M4 Motorway and the M5 South West Motorway, all in NSW.

Whilst the PPP model used for these and later tollroads has changed over the years, the central premise that a PPP concession must “stand alone” financially has not. All PPPs which rely on tolls are based on a financial model which sets the toll to generate revenue sufficient to fund the project, sometimes in combination with a contribution from the State. User-funded PPPs also move the capital expenditure for the asset off the State’s balance sheet.

The State Agencies of last century set aside large corridors for road development. Most of these have now been utilised. In addition, community concerns related to noise, urban amenity and pollution have seen many roads (even where there is a corridor available) being diverted underground. Consequently, the cost of construction of new motorways has increased considerably. Tunnels can cost as much as ten times their surface road equivalent, further stretching government’s budgets and making it more and more difficult to fund PPP road projects on a “stand alone” basis.

At the same time, there have been a number of financial failures of road PPPs, resulting in considerable losses to the original investors, but not to the State. As a result, most private sector financiers and constructors have now become very reticent to invest in greenfield PPPs where they are expected to accept patronage risk. Furthermore, conservative investors such as superannuation funds find it difficult to commit to investments involving patronage risk. With governments short of cash and reticent to borrow, this has led to a search for alternative PPP models which lessen or remove the requirement for the private sector to accept patronage risk.

III. What does the State want from a PPP?

The State is responsible for network planning. These days, when the State has approached the private sector to build and operate a PPP road project, it has been seeking the following from the successful bidder:

- To “infill” a gap in the planned motorway network;
- To effectively manage its own affairs, including all the following;
- To fund the project, either in its entirety or with a government contribution;
- To design the project, working in collaboration with government guidelines, reference designs and legislation, but usually seeking innovative solutions;
- To construct the project in accordance with the approved design;

- To maintain the road corridor, including pavement, landscaping, fences, signage, tolling equipment, control centre and all roadside communications, controls and messaging;
- To operate the road, including manning the control centre, managing access, controlling traffic speed, congestion (to the extent possible), incident response, network cooperation, attending incidents and cooperation with emergency services;
- To operate a tolling system which enables customers to use their vehicles on the project road and all other Australian tollroads, including building good relationships with customers and providing effective service;
- To demonstrate that the PPP entity is a good corporate citizen; and
- To be an effective issues manager and to minimise the negative impacts to the State of issues arising from the PPP concession.

More recently, some States, acknowledging the longevity of the relationships between the PPP entity and the State, have been seeking mechanisms to address:

- Future expansion and development of the asset;
- Quality of service through the introduction of Key Performance Indicators (KPIs) along with financial penalties for non-performance.

In addition to tollroads operated by the State (State Full Responsibility), there are two broad categories which the State has used for PPPs. These are Full Concession and Hybrids.

Full Concession

A private sector consortium is responsible for finance, design, construct, operate and maintain under a concession agreement. The consortium manages customers, tolls the facility and accepts all patronage risk. Some concessions subcontract their customer service activities to others, but remain responsible for them. Later concessions usually have an upside toll revenue sharing arrangement with the State and some have KPIs with penalties for under-performance. Concession periods can vary between 20 and 99 years, but most have been around 30 to 50 years. Some earlier concessions could escalate tolls in excess of CPI, but later ones are limited to increases not exceeding CPI.

Hybrids

These lie somewhere between State Full Responsibility and Full Concession, as noted in Table 1 and have taken a number of forms.

“Right to toll” concession

A hybrid where the State (or, in Queensland, Brisbane City Council (BCC)) initially undertakes the financing, design and construction, operation and maintenance (and sometimes, tolling), but once patronage ramp-up is complete, tenders a concession for the operation and maintenance with the right to charge customers a toll. Concession periods are generally much shorter because they do not need to amortise the cost of the initial capital works which is borne by the State. There may be risk and benefit sharing with the State in the form of a “cap and collar” to toll revenue.

Availability model

This model is similar to PPPs used for social infrastructure. The private sector concessionaire funds, designs and constructs, operates and maintains for an agreed concession period. The road is free to customers. The concessionaire receives fixed payments for the life of concession with penalties if the road is unavailable (in part or in full) for longer periods than agreed or if KPIs are not met.

Table 1: Summary of Australian road PPPs by type.

Name	Year opened	Model	Comment
NSW			
Sydney Harbour Tunnel (SHTC)	1992	Hybrid	Concession design, construct, maintain, with State to operate and toll. State pays SHTC a payment based on traffic revenue, but with a minimum payment to protect downside risk to SHTC
M4 Motorway	1991	Was Full Concession, now Freeway	
M5 South West Motorway	1992	Full concession	
M2 (Hills) Motorway	1997	Full concession	Tolls escalate in excess of CPI
Eastern Distributor	1999	Full concession	Tolls escalate in excess of CPI
M7 Westlink	2005	Full concession	Upside profit sharing
Cross City Tunnel	2005	Full concession	Contribution to the State
Lane Cove Tunnel	2007	Full concession	
WestConnex	???	Not yet known	Will be tolled
Victoria			
Citylink	1999	Full concession	Upside profit sharing
Eastlink	2008	Full concession	Upside profit sharing, KPIs on performance
Peninsula Link	2013	Availability model	
East-West Link	2015?	Hybrid	Proposed to be built and funded as an Availability Model, but will be tolled with revenue to the State. The State may later sell a Right to Toll concession
Queensland			
Logan, Gateway motorways	2011	Full concession	Originally fully government owned and built, now effectively privatised concession. Upside profit sharing, KPIs on performance, UPD (see below)
CLEM 7 tunnel	2010	Full concession	Under receivership. Currently being sold
Airport Link	2012	Full concession	Under receivership
Go Between Bridge	2013	Right to toll	Originally procured by BCC under D&C, fully financed by BCC with tolling contracted but revenue to BCC. Now being sold as “right to toll” concession
Legacy Way	2013	Right to toll	Under construction as D&C contract fully financed by BCC. Now being sold as “right to toll” concession with “cap and collar” on toll revenues

IV. The evolution of PPP concessions in Australia

One can trace the evolution of PPPs in Australia as going through the following periods over the past two decades. An example of each phase is noted:

- Phase 1: PPP with private negotiation, private sector funding, assured revenue with upside revenue potential based on patronage (SH Tunnel).
- Phase 2: PPP tollroad tendered primarily on lowest toll, full (or part) private sector funding, full patronage risk borne by private sector (M5 South West).
- Phase 3: As phase 2, but also tendered with Key Performance Indicators and penalties for under-performance and with upside revenue or profit sharing (Eastlink)
- Phase 4: As phase 2, but also tendered on size of lump sum contribution to the State (Cross City Tunnel)

The following two phases demonstrate the more recent search for alternate ways to deal with patronage risk.

- Phase 5A: Ways to minimise patronage risk (availability models) (Peninsular Link)
- Phase 5B: Cap and collar arrangement which shares patronage risk and reward (Legacy Way).

There is a link between the procurement options and the appetite of the private sector to accept patronage risk. Early tollroad concessions were bid on higher Returns on Equity (ROE) with higher allowances for risk and were thus more profitable even when patronage did not reach forecast levels (as it often failed to do). In some cases patronage risk was ameliorated by a long concession period and higher than CPI escalation rates for tolls. Later, these two measures disappeared as a result of competition to win bids. As governments became more aware of the profitability of concessions, they sought tighter deals under more rigorous and demanding contracts and the private sector was willing to oblige. Because of the success of some earlier concessions, a bid fever developed with bidders trying harder to win. There is no doubt that a “death spiral” developed wherein bidders placed pressure on modellers to reduce patronage forecasts – the very forecasts which were the key to the viability of their bids.

The key players in the establishment of bid consortia are the bid manager/financial adviser, the equity investor, the constructor and the operator. They come together to form the Single Purpose Vehicle (SPV) which makes the bid. In some cases the operator has been a subsidiary company of the constructor and becomes a sub-contractor to the SPV rather than an equity partner.

The constructor and the financial adviser have little interest in remaining as equity investors in the SPV once construction is complete. In a number of cases, the SPVs have found themselves dominated by the constructors during construction. The constructors and bid advisers then sell their equity and move on, leaving the SPV to deal with its longer term issues, in some cases with little control over the operator and its costs.

Australian governments have become more aware with time of the necessity for the SPV to be able to demonstrate its ability to operate effectively. Consequently, later concessions have

required that the constructor's equity, supported by its balance sheet, remain in place for some period following construction. They have also mandated improved operation and maintenance through the provision of KPIs and performance penalties. These measures have strengthened the arm of the SPV in controlling its obligations.

A further evolution has seen the introduction into two concessions in Queensland of an Upgrade Process Deed which sets out a mechanism for the State to procure additional works either on or adjacent to the concession. The intent is to make such a process easier, quicker and more effective for both parties. Since the concessions have long duration, this facilitates the process of accommodating unforeseen change. For instance, if such a provision had been included in earlier PPPs, the widening of the M5 South West motorway in Sydney may have happened ten years ago.

Note: Dates shown are opening dates, not dates when concessions were let.

Figure 1. The evolution of road PPP concessions in Australia.

V. Australian tollroads and patronage

This modern era evolution of Australian tollroads is unusual for a number of reasons. All Australian tollroads are intra-urban, whereas most tollroads world-wide are inter-urban. Furthermore, the majority of tollroads world-wide remain in State ownership (often via State-owned companies) and are considerably larger than Australian concessions. The fact that most Australian PPP concessions have required the private sector to accept patronage risk is unusual, though not unique.

Furthermore, most PPPs worldwide have been in sectors other than road infrastructure and are based on availability concepts. Thus the Australian experiment in tollroads has little direct precedent. The forecasting of traffic volumes is a tricky business at the best of times, but the Australian experience has led to increased risks. For example:

- The first stage in developing patronage forecasts is to analyse a network which is toll-free. The second stage is to then adjust using parameters which consider the way motorists value time (in itself, a very difficult process). The first stage sets a level playing field which is subsequently adjusted in the second stage. The second stage compounds the uncertainty of the first stage.
- The models work well on a corridor basis, less well for individual roads within the corridor and even less well for parts of individual roads. The smaller the focus, the higher the likely uncertainty.
- Some small tunnel projects are extremely expensive. Without substantial government funding, this necessitates high tolls to fund the capital expenditure. Individual higher tolls on short distances of road increase patronage uncertainty and combinations of tolls further complicate the decision-making process for motorists, further increasing uncertainty in predicting route choice.
- There may be other (as yet undefined) factors that encourage some motorists to avoid tunnels.
- The network model (without the new road) is verified using the most recent available traffic counts. Thus this model can be considered to be an accurate description of current traffic volumes. The model is then modified to incorporate the new section of road and then projected forward over decades (see fig 2). Projections become less reliable the further forward they look. Concession periods of 40 or 50 years (or more) are extremely difficult to forecast. In many cases, 85th percentile confidence levels can vary from the forecast by 50%.
- The ramp-up period (see fig 2) from opening to “steady state” is not part of the model output. Rather, it is based on judgement, taking into account other ramp-up periods on other roads. The curve commences from an assumed initial traffic volume and merges over a period of 18 months to 3 years with the steady state curve. This is the most critical period in any concession’s life and will make or break the financial support for the concession. Most concessions fail during the ramp-up period if they are to fail.

Figure 2. Components of a road patronage forecast.

From Table 2 and Fig 1, it can be seen that accuracy of patronage forecasts does not bear a close correlation with success or failure. A closer correlation is achieved if one looks at the toll per km and the type of asset.

Table 2. The uncertainty of patronage forecasting.

Name	Current patronage	Original Patronage vs Original Forecast	Type of asset and length (km)	Current toll per km \$ (see note 1)
NSW				
Sydney Harbour Tunnel	Very high	Not known	Mostly tunnel 4.0	0.50 (see note 5)
M4 Motorway	High at end concession	Satisfactory	Road 12-20? (see note 3)	0
M5 South West Motorway	High	Lower	Road 22	0.20
Eastern Distributor	High	Lower	Mostly tunnel 6	0.50 (see note 5)
M2 (Hills) Motorway	High	Lower	Road (very short tunnel) 21	0.24
M7 Westlink	Good	Lower	Road 40	0.18

Cross City Tunnel	Low	Much lower	Tunnel 2.1	2.33
Lane Cove Tunnel	Low	Much lower	Mostly tunnel 3.6	0.84
Victoria				
Citylink	High	Higher	Road + tunnel 22	0.35
Eastlink	Good	Lower, predominantly in the tunnel	Road + tunnel 39	0.15
Queensland				
Logan motorway	Good	Not known	Road 37	0.09
Gateway motorway		Not known	Road + bridge 31	0.07
CLEM 7 tunnel	Low	Much lower	Tunnel 6.8	0.61
Airport Link	Low	Much lower	Mostly tunnel 6.7	0.56
Go Between Bridge	Low	Much lower	Bridge <1	2.88

Notes

1. Tolls per km are calculated based on the longest possible trip on the concession in a car for an account holder using an electronic tag, taking into account trip caps where applicable.
2. All tolls are current at 19 August 2013 and will change with time.
3. The M4 motorway concession was for only some 6km of road. However, from a motorist's perspective, the perception was more like 12 to 20 km.
4. Tolls on Sydney Harbour Tunnel and Eastern Distributor have been halved since tolls are only applied in one direction.

VI. PPPs – Score Cards

All PPPs have been very effective in transfer of the following risks from the States: Finance, patronage, D&C, operation, maintenance and customer service. More detail is provided below.

Debt and equity: A number of PPPs have overestimated patronage and been unable to survive on original funding arrangements. So far, failed concessions have been resurrected through normal market operations such as refinancing, capital raisings, write downs and transfer of ownership. At no time has any State borne financial risk from a failed PPP, nor has there been any shortage of buyers for failed PPPs.

Design and Construct: Variable standards of design, particularly in relation to urban architecture and landscaping (with Victoria so far well above the other States in their expectations and outcomes), some structural issues but, overall, a good to excellent standard of functionality.

Management: All PPPs have been reasonably well managed. However, the most successful PPPs have been ones with a strong management, good contractual arrangements (particularly in relation to sub-contractors), a competent, collegiate Board who have developed a very good working relationship with the State.

Operate and Maintain: Variable with some concessions lacking adequate contractual power to ensure a high standard of maintenance, but, overall, a good to excellent standard. The standard of asset maintenance of PPPs is superior to that of the public sector assets. This is not a reflection on the public sector. The private sector PPPs are better able to provision for long term maintenance than are State owned entities subject to the budgeting pressures of government.

Customer service: Very good in all PPPs with this functionality.

Issues management: Overall, very good, especially when there are effective counter-parties within the State. The management of PPP concessions should be a dedicated function within government since these are invariably very complex relationships.

VII. Barriers to Future PPPs

Governments face a number of difficulties in future PPP procurement. Whilst some have been referred to previously, the list includes:

The huge escalation in the cost of projects - There are few corridors set aside for new road infrastructure or even for road widening. Consequently more road infrastructure must be built in tunnels.

Existing patchwork of highly variable tolls in some states (see table 2) - Since each PPP procured so far has been funded independently, tolls vary considerably and can be seen as a barrier by motorists to paying tolls on other portions of the road. The variability of tolls on concessions in NSW is producing unfortunate outcomes. Some tolls are far too high in relation to motorists' perception of value for money and some of the tolls are escalating far more rapidly than others. A re-negotiation and rationalisation of tolls on existing concessions appears inevitable at some time in the future. Victoria has few problems in this regard and Queensland lies somewhere between the other two states. Congestion is enhanced by the patchwork approach.

Patronage modelling uncertainties - There is little confidence that patronage modelling can demonstrate the reliability required by financiers and investors. However, this may be a position which will change with time.

Public perceptions - Because the public's viewpoint is based on the concept that roads should be funded from the public purse, tollroads remain fixed in the public perception as "double taxing". Tollroads must demonstrate value for money to become accepted by motorists. Some do, but this remains a significant political risk. The task of providing the public with sufficient information to gain acceptance of tollroads has not yet

VIII. A Way Forward?

If we accept that PPPs have provided very good value to the States so far, future models should be built on what has been learned from existing models. Future models should contain the following features:

- A contract which encourages innovation in design, community services and operation.
- A rounded and effective consortium for the Single Purpose Entity (SPE) who contracts with the State, comprising:
 - Reputable constructors with real balance sheets and the expectation of a long presence in Australia;
 - Sufficient equity with constructors and bid managers equity participation to extend (say) 12 months beyond opening;
 - A strong financier group in place with Australian Banks well represented. Varied tenor;
 - An operator with a strong track record in operating road infrastructure and managing sub-contractors;
 - Adequate control of the destiny of the SPE. For instance:
 - Contracts for Design and Construction, which has adequate provisions for reporting, truly independent certification and retentions which assure that defects will be addressed promptly.
 - Maintenance and (if sub-contracted) customer service contracts which provide for regular “mark to market” assessments of contracts with provision to terminate if adjustments not agreed;
- All bids being equal, a bid assessed on Return on Equity with the State accepting adequate provisions for risk in the assessment of Cost of Capital; and
- A blueprint for future negotiation of modifications and upgrades to (and adjacent to) the asset.

IX. How to deal with patronage risk?

If patronage risk is to be passed on to the SPE, some means of assessing and rejecting outlying bids becomes necessary. One option is for the State to prepare a patronage forecast and require bidders to bid on that forecast and subsequently accept full patronage risk. The State would set the length of the concession and assess the bids on a bid model ROE and the quality of the bid offerings. It may be difficult to assemble an SPE capable of accepting this risk at this time for any Greenfield project.

Therefore, States might apply a “cap and collar” approach where the State accepts the outlying patronage downside risk and shares upside benefit. The sale of Legacy Way to Queensland Motorways takes this form. However, it only applies to a right to toll concession, construction having been undertaken separately. Similarly in Victoria, the East-West Link may be procured under a similar process, utilising an availability concession for procurement and a subsequent right to toll concession once patronage is established.

An even more radical approach would require a restructure the motorway networks as follows:

- Re-negotiate all existing concessions so that a uniform toll per kilometre is applied to the concessions and to all existing freeways. In Sydney this doubles the length of the tolled network. By having a uniform charge per kilometre, distortions caused by existing tolls are eliminated. The more expensive concessions are cross-subsidised by

the less expensive ones and by the tolls from existing freeways. In this way, patronage risk is amortised over the entire network and becomes almost negligible.

- Apply the considerable revenue stream (after cross subsidies) to the procurement of new assets, preferably using the State's revenue as seeding to capture private sector investment via PPPs.

Conclusion

The procurement by the States using PPP models for road infrastructure in Australia is still maturing, despite setbacks. Since they offer significant benefits to the states, it can be expected that PPPs will form a part of future procurement, though models may well change with time.