

Towards a framework for evaluating financing alternatives for High Speed Rail along the East Coast of Australia

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Abstract

In mid 2011 the Australian government released the results of Phase 1 of a study on the economic benefits and financial viability of a high speed rail (HSR) network connecting cities along the east coast of Australia. The estimated economic benefits from HSR in Australia have increased owing to a range of environmental and emissions credentials, its ability to provide capacity relief for airports, as well as significant economic stimulus and employment opportunities. However, while earlier studies have found that HSR could be capable of being self-funding in the operating phase, this excluded the massive initial capital outlay that would be required. A full Brisbane—Melbourne HSR system is estimated to cost in excess of AU\$100 billion. It is likely that a combination of public and private means would be required to make HSR a reality for Australia. However, capital is becoming hard to source for large scale infrastructure. The implications of the Global Financial Crisis include significant pressure on world capital markets from sovereign debt issues, the demise of many leveraged private capital arrangements and poor performance of infrastructure funds. On top of the undesirable characteristics of financing public infrastructure (including regulation and safety aspects), this project could expect a reluctant private equity environment, the more so given the reputational damage associated with delayed and abandoned rail developments.

The question then becomes ‘*how do we select the best capital raising method that could feasibly finance a multi-billion dollar high risk project?*’ The economic case for HSR is contentious and this paper tries to stay clear of the debate for and against HSR. Instead this paper focuses on developing an understanding of the concepts involved in evaluating financing alternatives, review evaluation approaches available in the literature, and contribute concepts to be considered in the development of an evaluation framework for this type of infrastructure.

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Keywords: Financing alternatives; public infrastructure, High Speed Rail, capital raising alternatives, evaluation framework.

1. Introduction

This paper focuses on the financing aspects for a high speed rail (HSR) project along the East Coast of Australia given the set of particular challenges faced by such an enormous and complex project.

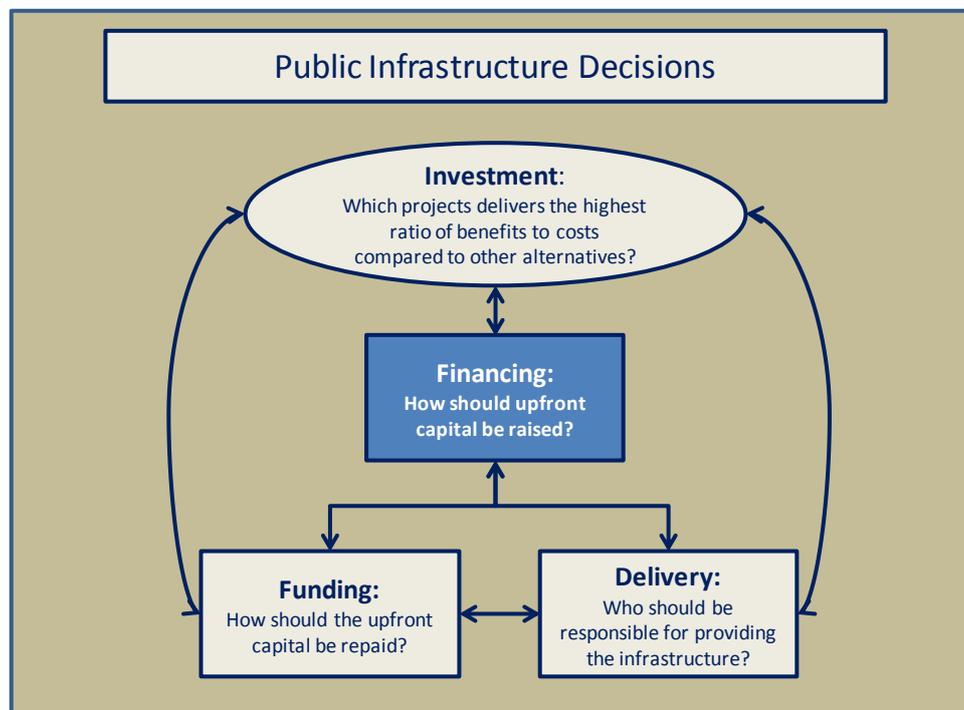
A government's choice of financing is often determined by institutional constraints (including legal, tax, government structures) and views on the role of government in financing that are popular at the time (Chan *et al.* 2009, p. 9):

Governments finance infrastructure with different degrees of dependence on particular vehicles, subject to numerous influences such as infrastructure characteristics, fiscal and macroeconomic conditions, institutional arrangements and prevailing views about the role of government.

However, there are a multitude of financing options available, as well as a spectrum of objectives, guiding principles and criteria that contribute to selecting an optimal financing alternative. Selecting the correct financing alternative is important for a large infrastructure investment such as the East Coast HSR, as it has significant implications for the total amount of financing costs and how the costs and risks are shared between public and private, as well as between federal, state and local government levels (GAO 2002, p. 8).

Debate continues regarding the economic case for an East Coast HSR project, as well as the optimal mix of public and private delivery alternatives for this potential project, with successes and failures evident in all models. This paper will briefly explore the distinction between the related concepts of investment, financing, funding, and delivery, given the confusion that exists between these areas. However, while these aspects are related and may affect the choice of financing alternative, they are not the focus of our study. Our study will assume a likely delivery model (which is expected to be some variation which includes private participation) and probable HSR solution (e.g., a full east-coast corridor implementation with high alignment optimization and high track dedication or Australia's own 'Shinkansen' as in Charles, Ryan & Kivits 2011) and explore how to evaluate financing alternatives within that context (see Figure 1 below)¹:

Figure 1: Study scope



Our paper is structured as follows: A summary of previous East Coast HSR studies (Section 2), Financing models used internationally for HSR (Section 3), then more broadly for infrastructure of a similar nature – Section 4. It then seeks to clarify the use of commonly

¹ Adapted from concepts and diagrams used in Chan *et al.* (2009) and Vander Ploeg (2006).

confused concepts and terminology, as well as its classification (Section 5), how the literature evaluates financing alternatives (Section 6), a high level overview of the financing alternatives available for East Coast HSR (Section 7), and finally our conclusion from this preliminary study as well as further research identified (Section 8).

2. Previous East Coast HSR studies

Many proposals have been put forward for different versions of an East Coast HSR since the 1980's. However, these initial proposals failed to proceed as a result of indications that significant government subsidies or tax shields to the private developers would be required to make them economically viable. The following three subsequent studies were reviewed for their contribution on capital raising considerations:

- East Coast Very High Speed Train Scoping Study (ARUP TMG 2001)
- High-speed Rail: Strategic information for the Australian context (CRC 2010)
- HSR Study Phase 1 (AECOM 2011)

While these studies dealt with some aspects of capital raising considerations, it has not been the focus of studies to date. Instead the studies discussed delivery models which are likely to emerge, and some financing considerations, but do not provide a mechanism for choosing the most appropriate solution.

A consistent theme that emerged from the studies is that a combination of public and private finance would be required, predicting a dominant role for the public sector in providing financial support.

As, prima facie, the project seems non-viable without financial and other support from the Governments, they would need to be the initiators and owners of the project (ARUP TMG 2001, p. 11).

Given the relatively small proportion of Commonwealth funding for rail investments ... the Federal Government is interested in encouraging and utilising private sector investment in rail infrastructure investments in lieu of public funding ... While a PPP component will be required for any Australian HSR program, international experience suggests that it will be a limited component targeted at the operational end of a lengthy project cycle such as rolling stock operations or maintenance (CRC 2010, p. 11).

There are few examples of a HSR service fully recovering capital costs except in the very long term. Operations and maintenance costs are usually self-funding, but infrastructure costs are unlikely to be fully recovered without a significant government contribution (AECOM 2011, p. 13).

3. Financing HSR

Two main models are typically used for financing HSR, each with different capital raising implications (ARUP TMG 2001, CRC 2010):

- **Government as long term developers and owners** is the most popular model. Many examples of HSR followed this model, such as much of the European HSR network (including TGV in France); Shinkansen lines in Japan (developed by government owned entities, later progressed towards independent entities); South Korea and China.
- **PPP models** with combined private and public sector financial commitment are less often used for financing HSR, and regularly included significant government guarantees. HSR examples include the Channel Tunnel Rail Link (UK – France); Channel Tunnel Rail Link (Channel Tunnel - City of London); Spain-France; Netherlands- Belgium (the 125 HSL-Zuid line), Taiwan (Taipei-Kaoshiung); Shanghai MagLev; as well as HSR proposals for California and the UK.

HSR is becoming more commonplace globally. It is likely that there are sufficient lessons learnt with regards to how to evaluate and select the best financing outcomes for HSR. However, the authors were unable to identify any comprehensive international studies which present an evaluation framework for financing HSR. This motivated the authors to perform a broader literature review as discussed in Section 4.

4. Financing Public Infrastructure

Given the scant attention given to date in the literature on evaluating capital raising methods for HSR, the review was broadened to identify studies that reviewed capital raising alternatives for infrastructure of a similar nature.

4.1 Defining Public Infrastructure

Firstly, the term “infrastructure” is easier to recognise than to define. A paper by Kay concludes that where all or most of the following characteristics are present, activities are commonly classified as public infrastructure (1993, p. 55):

- Networks: Delivery systems involve substantial interactions in the provision of services.
- Strategic importance: They form a small but indispensable part of the total cost of the wide range of products in which they are used, rendering the losses due to service failure very large relative to the basic cost of service provision.
- Natural monopoly: There are substantial elements of natural monopoly.
- Capital intensive: Capital costs are large relative to running costs.
- Predominance of sunk cost: The sunk costs of establishment are significant.

Infrastructure is also commonly categorised into economic and social infrastructure. ‘*Economic infrastructure comprises the long-lived engineered structures, equipment and facilities, and the services they provide that are used in economic production and by households*’ (Merna & Njiru 2002, p. 22). Examples of economic infrastructure include utilities such as water and waste, telecommunications, roads, power, gas, electricity. Social infrastructure usually refers to services such as health care and education.

HSR is classified as economic infrastructure for the purpose of this study, as it meets the characteristics and definitions described above. While the strategic importance of high speed rail may be debateable, the other characteristics appear to be met.

Technically, passenger rail is not a pure “public good” (non-exclusive and non-rival), but a quasi-public good, which means that it can be simultaneously a private market product (with the characteristics of excludability and rivalry in consumption), while also creating large positive or negative externalities (the justification for public intervention) (Vander Ploeg 2006, Ubbels *et al.* 2001 and Gannon & Smith 2009). These grounds can also be argued to hold for HSR, placing HSR in the quasi-public good category.

This ‘boundary’ status between the public and private realms explains the many and varied delivery models emerging historically, ranging from purely private (the origins of rail development in the US and UK), to public provision (nationalisation of rail in the US and UK during the world wars), to the recent wave of Public Private Partnership (PPP) models (Nelson 2005).

4.2 Review findings

The review identified a substantial body of literature on various aspects of financing public infrastructure². However the review suggests the need for an agreed framework of concepts, definitions and evaluation criteria. Inconsistencies in the use of terminology, and classifications were widespread and there does not appear to be a universally accepted approach for evaluating alternatives with a view to selecting the best alternative.

A summary review of thirteen prominent global studies on capital raising alternatives for public infrastructure is attached in an appendix. It was found that the majority of studies:

- **Are not rigorous or careful in the use of the terms “financing”, “funding” and “delivery”.** Examples include: ‘... uses the term “innovative finance” to refer to any funding measure other than grants to states ... debt financing... (the) term is used to contrast that approach with traditional methods of funding highway projects’ (GAO 2002, p. 3) and “grant funding” listed as a category on a spectrum of “finance” alternatives (Gannon & Smith 2009, p. 5). (See Table 1 in the appendix).
- **Use a multitude of categorisation methods**, including grouping alternatives into internal versus external to the public agency (Kitchen 2004), or conventional (traditional) versus emerging (innovative) approaches (ACG 2003). A number of studies also only focus on a sub-set of alternatives, e.g. local government/municipal alternatives only or comparing PPPs to “public alternatives” (ACG 2007). Following the inconsistent use of definitions, as mentioned above, **classifications are also inconsistent**, e.g. in Brittain (2002) categories include what our study defines as “funding” mechanisms under the financing instruments (e.g. “user fees” – which we define as a funding type included under non-debt financing alternatives.), while Kitchen 2004 includes delivery mechanisms (e.g. PPP) and funding alternatives (e.g. taxes) under “finance” alternatives. (See Table 2 in the appendix).
- **Apply a range of evaluation methods**, with the scope of studies ranging from those that provide an overview of alternatives (e.g. reviewing select aspects and considerations, without resulting in the selection of an alternative) to more in depth qualitative and even quantitative evaluations, in order to aid in the selection of an alternative; while a few others focused on providing high level frameworks (refer Table 3 in the appendix).

Despite these inconsistencies the studies reviewed were, however, extremely helpful in providing guidance on different aspects of a possible evaluation framework that could be universally applied to select alternatives for financing public infrastructure. While some studies provide clear definitions and distinctions between related concepts, others contribute robust classification methods, while still others assist by suggesting evaluation methods, as discussed below:

5. Proposed definitions and classification

The act of analysis refers to an ‘investigation of the component parts of a whole and their relations in making up the whole, and a statement of the results of this’ ([Collins English Dictionary](#) 2003). First off, we suggest terminology and definitions to be used, followed by a possible approach to be considered for classifying alternatives.

5.1 Definitions

Terms like investment, finance and funding are often used interchangeably, not only in the literature reviewed (per Section 4), but also in the general media: *Media discussion*

² While the literature reviewed often used the term “public” infrastructure, the infrastructure in question often included quasi-public goods.

frequently does not draw a distinction between these processes, calling for the superannuation industry to “fund” more infrastructure projects rather than finance further investment in such projects’ (Ernst & Young 2011, p. 6). However, these concepts require clarification and distinction to avoid confusion. Our study adopted the following distinctions and definitions, as also depicted in figure 1 (Section 1):

- Productive investment decisions refer to selecting opportunities that maximise present value. For public infrastructure this amounts to more than financial considerations, instead investments are expected to add to community welfare. Therefore, ‘... an investment is efficient in allocating resources if it delivers the highest ratio of benefits to costs compared to other alternatives. These alternatives include options such as expenditure on other public services or returning the funds to taxpayers...’ (Chan *et al.* 2009, p. XVIII).

Investment is, however, distinct from financing. The Fisher Separation Theorem postulated in the 1930s that a firm can make the investment decision independent from its financing decisions, and that productive investment opportunities that maximise present value can be determined independently of the best way of financing (Fisher 1930 in Chan *et al.* 2009).

Although investment and financing are two separate concepts, they are related in that cost savings involved in financing decisions may be substantial for large and complex infrastructure projects. The choice of financing vehicle also involves decisions about risk sharing and transfer. Beneficial risk sharing or risk transfer can be expected to reduce risk premiums, which in turn imply a reduction in the total cost of financing. Furthermore, ‘the financing vehicle may provide information and create incentives that improve other aspects of an efficient investment decision’ (Chan *et al.* 2009, p. 13).

- The financing of infrastructure is defined as selecting the immediate source of upfront capital to undertake capital investment (constructing a new asset, or renewing, rehabilitating or reconstructing an existing asset) (Chan *et al.* 2009, p. xxiii).
- The funding of infrastructure is a separate matter and refers to the revenue stream that repays or recovers that upfront capital costs (i.e. the allocation of ultimate cash flows to service the financing method of public infrastructure) (Ernst & Young 2011, Chan *et al.* 2009, Vander Ploeg 2006). An example would be a toll road which is financed through a mix of private sector debt and equity, with this private investment funded by toll charges from users of the asset (Ernst & Young 2011).
- Finally, a related term which consistently comes into play in the literature reviewed is delivery mechanisms. Delivery is defined as making the decision of who should be responsible for providing the infrastructure and encompasses the end-to-end process of infrastructure delivery, from developing the specifications, procurement, obtaining finance, construct, to operating, funding and overseeing delivery (Vander Ploeg 2006). Vining and Boardman (2008) identifies three major categories for infrastructure delivery: Direct public provision, contracting-out to the private sector (i.e., design, build, transfer), or public–private partnerships (PPPs).

5.2 Classification

Best practice in categorisation or grouping is to ensure that categories are mutually exclusive and collectively exhaustive (the MECE principle). This concept holds that when we separate a set of items into subsets we need to ensure that there are no overlaps (mutually exclusive) or gaps (collectively exhaustive) in the categories (Minto 1996).

Following a systematic and robust categorisation approach is particularly important to ensure that the full spectrum of alternatives is initially identified, prior to an evaluation or assessment, to ensure that the optimal alternative is selected. It also forces a rigorous

evaluation approach, by instilling the discipline of identifying all possible alternatives upfront, prior to a robust justification for the elimination of alternatives based on objective criteria.

The definitions used in studies reviewed were compared to definitions adopted for our study and then further considered in view of MECE best practice for categorisation. The comprehensive study by Vander Ploeg makes a clear distinction between the dimensions of “financing”, “funding” and “delivery” models which all meet the MECE requirements (2006, p. 2):

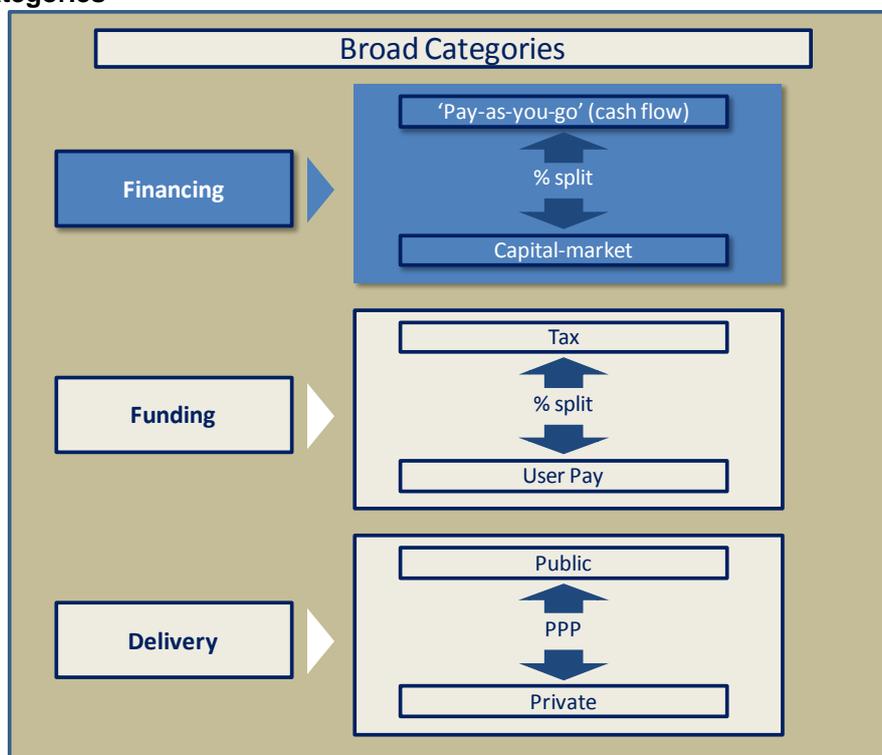
It is true that the methods of infrastructure finance cannot be expanded. The triple-two rule asserts that there are only two ways to finance, two ways to fund, and two ways to deliver infrastructure. In terms of financing, governments can either borrow or use pay-as-you-go. In terms of funding, governments can either use taxation or user pay. In terms of delivery, infrastructure can be provided publicly through government or through non-governmental actors such as the private or nonprofit sector. However, while the basic methods are limited, the range of tools available to implement them is broad ...

Chan *et al.* (2009) offers a similar classification for financing vehicles, however the study introduces the notion of capital markets (as opposed to term “borrowing” offered in Vander Ploeg 2006), to allow for equity contributions from the private sector (p. 9):

Governments have employed a variety of financing vehicles. They fall into two broad categories: ‘pay-as-you-go’ (cash flow) financing — based on current revenues or savings within the public sector (and) capital-market financing — based on borrowings or equity contributions from private sources.

The categorisation of Vander Ploeg (2006) to distinguish between finance, funding and delivery was adopted for our study, further refined to incorporate the concept of capital markets, as offered by Chan *et al.* (2009) and as indicated in Figure 2:

Figure 2: Categories³



This classification method contains the boundary classes for the purposes of analysis and we start off with the highest level of classification. However, there are a lot of variations and

³ Adapted from concepts and diagrams used in Chan *et al.* (2009) and Vander Ploeg (2006)

combinations within these categories, as well as a multitude of options within each category. When it comes to financing, for example, Vander Ploeg (2006) identifies six traditional and thirteen innovative pay-as-you-go (PAYGO) financing sub-categories. Also, often methods are combined to raise capital for a large project. The Gold Coast Rapid Transit project for example developed a financing “cocktail”, consisting of a mix of bank debt, equity, and contributions from the federal, state and local levels of government (Ernst & Young 2010, PWC 2011). A key question for the East Coast HSR might therefore be what proportion should be PAYGO and what proportion public debt or equity? Financing might also change during the lifecycle of infrastructure, and for HSR it might start out as PAYGO but end in the financing authority having to issue bonds (public debt) to cover a deepening budget deficit situation, as was the case for HSR in Greece. HSR furthermore has the federal/state issue – what proportion would be federally financed and what proportion state financed. The states and the federal government may adopt different financing positions. In Europe, governments have sought external financing for HSR. The same issues appear here with states seeking federal financing.

6. Evaluating financing alternatives

Our literature review has not revealed one complete evaluation framework which could be applied to HSR to select the optimal financing alternative. The context and scope of the studies reviewed differed, and were inconsistent in terms of categorisation and definitions, therefore evaluations of financing alternatives often included funding and delivery concepts. However, the studies reviewed contribute important components for the design of an evaluation framework, which we plan to develop further in subsequent phases of our research.

Three evaluation categories were identified:

- **Comparisons:** These are studies which attempt to aid in or result in a selection of an alternative or set of alternatives, based on a set of criteria. These studies were further sub-categorised into qualitative and quantitative evaluations.
- **Overviews:** Studies in this category set out to provide an overview of financing alternatives, based on a number of considerations, including advantages and disadvantages, applications, and case studies. While these overviews assist us in understanding alternatives better, and offers considerations to be included in an evaluation framework, it does not set out to select an alternative.
- **Frameworks:** The major contribution of these studies is the provision of a framework consisting of the different dimensions of the decisions to consider in evaluating financing alternatives. However, these studies also did not set out to select an alternative.

While the majority of studies neatly fall into one of these categories, some literature dealt with more than one of these aspects. Concepts which we suggest for inclusion in the development of a future comprehensive evaluation framework for an optimal HSR financing alternative are discussed below:

6.1 Qualitative comparisons (subjective criteria)

The qualitative studies contribute important, albeit subjective selection criteria. The challenge would be to identify how to operationalise and develop objective measures for these criteria.

Only two studies were found to offer qualitative comparisons of a broad range of capital raising alternatives, based on expert inputs and authors’ subjective opinions, with the aim of selecting an alternative or alternative(s). These were the studies by the Allen Consulting Group (2003) and Kitchen (2004).

Both studies indicate that the optimal financing alternative will depend on a number of factors, which will vary in different circumstances. Kitchen (2004), however, concludes that there are strong arguments for the use of debt financing.

The criteria used in these studies overlapped significantly as follows:

- **Effectiveness** - ‘...to mobilise sufficient funds for investment in infrastructure, and to do so in a timely manner’ (ACG 2003, p.103).
- **Efficiency** – Refers to the impact of an alternative upon wellbeing in general: ‘It essentially asks the question does the measure make people, the community at large or the environment better or worse off?’ (ACG 2003 p.103); ‘...resource efficiency is achieved where marginal costs equals price because this is the point where society secures the greatest net gain from the consumption of this service’ (Kitchen 2004, p. 8).
- **Equity** - ‘...the fairness or otherwise of an instrument ... sharing the burden of revenue raising fairly between individuals who have differing abilities to pay’ (ACG 2003, p. 103). ‘Fairness ... is achieved (when) those who consume public services pay for them...’ (Kitchen 2004, p. 9).
- **Stability/ reliability** – Refer to an alternative’s ability to ‘provide steady and reliable access to capital’ (ACG 2003, p. 59).
- **Administration** – Approaches adopted have to be practical, greater simplicity makes it cheaper for government to collect or raise the funds required. (ACG 2003), ‘... the easiest financing system to administer is the one that is not confusing for taxpayers to understand and does not require an unnecessary amount of time and effort in administering it’ (Kitchen 2004, p. 8-9).
- **Compliance costs and certainty** – Compliance costs refers to ‘... paperwork associated with raising revenue ... (while) Certainty is crucial in effective planning for businesses’ (ACG 2003, p. 103).
- **Accountability and transparency** - Accountability of an alternative ‘is enhanced when the design ... is clear to taxpayers.’ Transparency ‘is an extension of the accountability argument (and)...is enhanced when citizens/ taxpayers have access to information and decision-making forums so that the general public is familiar with the way in which (alternatives) are set’ (Kitchen 2004, p. 8-9). ‘Transparency is a key means of reducing uncertainty as it facilitates an understanding of the process and issues that need to be dealt with.’ (ACG 2003, p. 103).
- **Stakeholder support** - ‘Governments are reluctant ... to pursue change that has no support, or apply measures that fall predominantly upon influential stakeholders. Governments typically give consideration to stakeholders’ reaction to ... options’ (ACG 2003, p. 103).

These criteria are also fairly consistent with those commonly used in Public Economics textbooks to evaluate tax systems, including fairness (equity), efficiency, administratively simple and politically responsible (Abelson 2008, Baily 2002, Rosen & Gayer 2008), as well as with the public infrastructure finance literature we reviewed, which were classified as frameworks, as discussed below.

The Ministry of Public Infrastructure Renewal (2004, p. 9) provides the following guiding principles for the examination and evaluation of models:

- **Protection of the public interest** – ‘All public infrastructure initiatives should be delivered efficiently; protect and promote public health and safety; ensure high-quality public services; and be accessible to all ...’
- **Value for money** - ‘All public infrastructure investments should be cost-effective, optimize risk allocation, and be completed on time and within budget. There must be safeguards

against financial returns that are not proportional to the associated risk where private financing is involved in the delivery of public infrastructure initiatives.’

- **Appropriate public control/ownership** - ‘In particular, consistent with the principle of appropriate ownership/control, the framework states that public ownership of assets will be preserved in the hospital, water/sewer, and public school sectors.’
- **Accountability** - ‘Public infrastructure initiatives should have clear lines of responsibility and accountability, rigorous and transparent reporting and oversight requirements, and clear, measurable performance measures.’
- **Fair, Transparent and Efficient Processes** - ‘All public infrastructure initiatives should have efficient and fair bidding processes, and contractual agreements that are based on clear, comprehensive guidelines and full public disclosure.’

The same study also provides a business-case analysis of the following criteria (Ministry of Public Infrastructure Renewal 2004, p. 25-6):

- **Financial:** ‘Which model delivers the initiative on the most cost-effective financial terms?’
- **Technical:** ‘What are the key technical issues impacting the initiative? Which model results in technical solutions that meet public service delivery needs?’
- **Operational:** ‘What operational issues impact the choice of procurement model?’
- **Public policy:** ‘What public policy/legislative/regulatory constraints exist on the choice of model?’
- **Implementation:** ‘What implementation issues/constraints affect the choice of model?’

Finally, Vander Ploeg (2006) suggests an altogether different approach to selection, based on the key characteristics of the infrastructure in question, such as marketability, large or small project, and long or short asset life (p. 4):

...governments must carefully assess their infrastructure needs, scan the list of available tools, and then put into play those tools that offer the best solutions for financing, funding and delivery...What is required is a close match between the infrastructure required and the most efficient and effective tool to finance, fund, and deliver that infrastructure.

6.2 Quantitative comparisons (measurable criteria)

Only two studies were identified which use quantitative means to compare financing alternatives, with the aim of selecting the best approach, for specific examples of financing public infrastructure. How applicable these models would be in evaluating financing alternatives for HSR specifically needs to be considered in future phases of our research.

6.2.1 Evaluation based on MONASH model of the Australian economy (MMRF)

ACG 2003 employs the MONASH model of the Australian economy (MMRF) to evaluate financing approaches. The model is applied to a mix of what we have defined to be financing, funding and delivery alternatives (although they are termed “funding approaches” in the Monash study). The model is described as a dynamic multi-regional, multi-sectoral Applied General Equilibrium model of the Australian economy. It is applied to evaluate the economy wide impact of policy issues, with users including the NSW Treasury, for initiatives such as the assessment of the Sydney Olympic Games. The model examines the impact of additional infrastructure as well as the burdens imposed upon the economy to pay for it and addresses key questions such as: ‘What difference does the choice of funding approach make? Does it pose meaningful implications for economic growth or jobs? If there are any differences are they essentially offset by the broader benefits obtained from investment in public infrastructure?’ (ACG 2003, p. 75).

This study examines two scenarios: An investment equivalent to \$200 million every 5 years; and an investment equivalent to \$5 billion every 5 years. The results are measured as the gains to NSW from each approach (benchmarked against state taxes) in terms of two criteria: The NPV of changes in the Gross State Product and in average jobs created annually over the investment period.

The results for both scenarios exhibit much the same characteristics with the difference being the scale of impact. Government debt ranked first, followed by Special Purpose Vehicles (SPV), residential rates, average aggregate state taxes (the benchmark), user charges and producer levies. The ranking indicates the economy wide impact, from favoured to least favoured and suggests a strong preference for the use of financing alternatives that match the cost to the community to the benefits from the use of infrastructure which are obtained over time — that is, government debt and SPV approaches. Producer levies ranks a long way behind the other alternatives, resulting in economy wide costs from the use of the levy nearly eliminating the benefits derived from the infrastructure it funds. It is also stated that the exact rank order applied to aggregate state taxes and user charges depends upon the weight assigned to output or jobs as an indicator of economic outcomes. User charges were found to be more favourable for employment, while state taxes are more beneficial for output.

Given that this evaluation study combined funding and financing alternatives in its assessments it is questionable how appropriate this model might be for specifically assessing the financing alternatives for HSR.

6.2.2 Evaluation based on costs

The last study which used quantitative methods to evaluate alternatives was prepared by the United States General Accounting Office (GAO 2002). This study compared the total present value costs of financing that governments (or the special purpose entities they create) would incur if they financed \$10 billion in infrastructure investment using each of four financing alternatives (being grants, tax credit bonds, tax exempt bonds, and direct federal loans). Direct short and long term financing costs are included, such as repayments, including interest payments on loans and bonds, as well as tax credits and taxes forgone for tax credit bonds and tax-exempt bonds⁴. The conclusion was that government grants had the lowest cost implications:

...grant funds are the lowest-cost method to finance a given amount of investment expenditure, \$10 billion. The reason for this result is that it is the only alternative that does not involve borrowing from the private sector through the issuance of bonds. Bonds are more expensive than grants because the governments have to compensate private investors for the risks that they assume (in addition to paying them back the present value of the bond principal) (GAO 2002, p. 8).

This study provides cost of financing aspects to be considered for inclusion in a qualitative evaluation of HSR financing alternatives.

6.3 Overviews and frameworks

The major contributions of the public infrastructure finance related overviews and frameworks reviewed are additional considerations and dimensions for selecting an alternative. The comprehensive overview of financing tools in Chan *et al.* (2009) for instance, provide descriptions of the applications and trends, policy issues, and strengths and weaknesses of alternative financing approaches; drawing from a range of international

⁴ Chan *et al.* (2009) provides a helpful framework for the calculation of the total cost of financing, including the return paid to the investors; any contingent liabilities arising from financial claims associated with the infrastructure investment, and transactions costs of negotiating and managing the financial vehicle, including any costs associated with delay in commencement of a project. This framework is complementary to the GAO (2002) study and appears to be a more comprehensive framework of cost components.

infrastructure development experiences. The strengths and weaknesses of the different alternatives (termed “financing” vehicles) were further assessed in terms of their implications for improving:

- project risk management
- transaction costs (including costs of delay arising from cash flow constraints)
- information and disciplines that contribute to more efficient investment (p. XIX)

Chan *et al.* also mention that the optimal choice of financing vehicle will depend on a range of considerations, including ‘the nature of the investment, the degree of asymmetry of information, the potential for competition, and the skills of the government as negotiators and contract managers’ (2009, p. XVI).

The dimensions and considerations suggested in these studies give us further pointers to possible evaluation criteria for the best financing alternative for HSR (see for example, the concepts discussed in the arguments for and against alternatives included in Section 7, emerging from our literature review). These could be translated into criteria and added to a possible future taxonomy of criteria for selecting a HSR financing alternative.

7. Preliminary financing considerations for HSR

In the absence of a comprehensive evaluation framework which could be applied to select the optimal financing alternative for HSR, we developed a short summary of what the literature had to say about the financing alternatives for public infrastructure of a similar nature. The results are summarised in Table 4 (refer Appendix) and were based on the definitions and high level categorisation adopted for this paper as indicated in Section 5.

The arguments in favour and against the different financing alternatives included in Table 4 in the Appendix suggest preliminary considerations for financing an East Coast HSR project. However, as the arguments presented here are not based on a consistent and complete set of objective criteria for selecting the optimal model (which we plan to address in future research), this does not represent a set of firm recommendations underwritten by the authors.

As mentioned earlier, it is likely that a PPP model will be used for the East Coast HSR. The PPP component would typically involve the creation of a stand-alone business corporation or special purpose vehicle (SPV)⁵) to finance and deliver the project, and use project finance to raise capital (BDW 2002 in Chan *et al.* 2009, p. 146):

Financing of a project’s capital typically involves a range of sources of equity and debt — these determine the SPV capital structure. Traditionally, equity for infrastructure projects has been provided by parties involved in some aspect of the project such as construction contractors. However, institutional investors (such as superannuation funds) are increasingly investing directly in infrastructure projects. Further, several specialist infrastructure investment funds have been established (for example, by Macquarie Bank).

Part of the finance for HSR would probably be coming from the public sector. The arguments presented in Table 4 mainly focused on public finance. The key messages as it pertains to public finance that emerged from the literature were:

- Given the concerns associated with intergenerational equity, the literature suggests that pay-as-you-go (PAYGO) financing should be reserved for assets where the benefits accrue primarily to current users, like infrastructure with a short life span and a short payback period (Vander Ploeg 2006, p. 52):

⁵“The sole purpose of the SPV is to carry out the business of the PPP by arranging the design, financing, construction, ownership, and operation of a new infrastructure asset.... Depending on the nature of the asset, the SPV may own the asset in perpetuity, it might be purchased by government, or the asset might be owned and operated by the SPV for a certain period of time and then transferred to government” (Vander Ploeg 2006, p. 143).

Following a pay-as-you-go infrastructure financing strategy across the board is an unduly conservative approach to infrastructure financing, particularly when considering large projects with high up-front costs and long life spans. Pay-as-you-go has a role to play, but only with respect to highly technological infrastructure that runs the risk of obsolescence, as well as smaller groups of assets that carry lower initial costs and possess shorter life-spans.

- Assuming a scarcity of PAYGO funds, debt is considered a good fit for large assets with large up-front costs and long life spans, particularly for infrastructure that is inherently marketable (Vander Ploeg 2006, p. 54):

Debt-financing is the logical alternative for those assets that do not provide a good fit with pay-as-you-go. Debt-financing is best used for infrastructure assets where the benefits accrue to the current generation as well as future generations. Such infrastructure is large, has a long life span, a long payback considered. Debt-financing is the most appropriate for one-off strategic capital expenditures that are non-recurring in nature. This reflects a basic principle behind infrastructure finance, which is to match the financing source with certain expenditure types... Debt-financing should always be considered for infrastructure that is inherently marketable. With marketable assets, the debt will be essentially self-financing through user fees. Refusing to apply debt-financing for marketable infrastructure results in a waste of precious pay-as-you-go dollars that would be more effectively employed elsewhere.

- However, as Vander Ploeg's analysis excludes a consideration of equity financing alternatives; it may well be the case that equity financing is appropriate for this class of infrastructure.
- Also, where infrastructure projects generate spill-overs within a country, or where donor governments have a specific interest or need for the infrastructure, grant assistance from central governments for capital infrastructure is generally regarded as being economically sound (Boadway 2001; Kitchen 2004; Oates 1972 in Chan *et al.* 2009). Therefore, should there be sufficient reserves available at federal level, it may be wise to use this to finance worthy investments, particularly those that may be considered nation-building investments.

In conclusion, according to the criteria adopted by the literature reviewed in Table 4, public debt and equity appears to be a suitable financing choice for an East Coast HSR, as the bulk of the project could be classified as long term public (or quasi-public) infrastructure with significant marketability. PAYGO finance may be reserved for the short term components of a HSR system⁶ (Vander Ploeg 2006). However, if the HSR project is considered a worthy nation-building project with significant spill-over benefits, it may indeed qualify for a significant portion of PAYGO financing.

These considerations are also limited to the most aggregate of classification levels for financing alternatives (capital market finance and PAYGO financing). However, HSR is expected to adopt a highly sophisticated financing alternative, which is likely to be a combination of these two high level categories, as well as different approaches to be adopted during different stages of the project lifecycle as alluded to in Section 5. Subsequent phases of our research are planned to drill deeper and review the variety of sub-classes of financing available, as well as aspects such as federal versus state financing, phased financing, and the role of tax shields.

⁶Examples include the use of leasebacks for rolling stock (subway cars) in Toronto (Irwin & Carpenter 2005 in Vander Ploeg 2006).

8. Conclusions and future work

This study addressed the questions of how to select the best financing alternative to build an East Coast HSR. A literature review was conducted of previous East Coast HSR studies' appraisal of financing alternatives, which was then broadened to look at how HSR is commonly financed internationally, as well as aspects relating to financing of public infrastructure of a similar nature as the proposed East Coast HSR.

It was found that there is no readily available comprehensive evaluation framework for financing alternatives for HSR or for similar public infrastructure. While there is a broad body of knowledge on financing public infrastructure, the work reviewed tends to contribute components of a possible evaluation framework, as opposed to an integrated methodology of multifaceted criteria and metrics. It was also found that there are widespread inconsistencies with terminology and concepts related in the discussion of financing alternatives for public infrastructure, as well as how financing vehicles are classified and assessed. Therefore, we first set out to develop a common basis of definitions and classifications before embarking on the development of an evaluation framework.

Despite the inconsistencies in analysis or assessment types, the literature contributes multiple objectives, principles and criteria that could be used to develop a multi-faceted set of criteria and metrics for selecting the optimal financing solution for an East Coast HSR project.

Finally, we looked at how the literature assessed the two main categories of financing [capital market financing and pay-as-you-go (PAYGO) financing]. From this we suggest preliminary considerations for an East Coast HSR project, based on arguments for and against these two options as presented in the literature. The arguments presented in the literature reviewed suggest that there is strong motivation for the use of public debt and equity finance, as the bulk of an East Coast HSR solution is long term in nature and has significant marketability, reserving limited PAYGO financing for the short term components of a HSR solution, such as rolling stock. However, if the HSR project is considered a worthy nation-building project with significant spill-over benefits, it may indeed qualify for PAYGO financing.

These considerations are based on arguments presented in the literature, and not on a consistent and complete set of objective selection criteria. Furthermore, the overview is presented at the aggregate level of the two boundary financing alternatives of capital market financing and PAYGO financing. However, an East Coast HSR project is expected to adopt a highly sophisticated financing solution, which necessitates a deeper review of the multiple sub-categories of financing alternatives and to address issues such as federal versus state financing, phased financing, and the role of tax breaks. Therefore these findings can only serve as preliminary considerations, as opposed to a set of recommendations underwritten by the authors:

A more comprehensive evaluation framework, which incorporates the multiple dimensions and aspects identified in the literature reviewed, is required to enable a more rigorous evaluation. This needs to be applied to the multitude of financing sub-categories that are available, as opposed to the high level alternatives presented in Section 7. We see the development of such a multifaceted evaluation framework as the major focus of subsequent research, using the definitions and categorisation proposed in Section 5, and drawing on the broad spectrum of quantitative and qualitative criteria covered in Section 6. These criteria need to be collated and translated into measurable metrics to assist in identifying an optimal financing solution for building an East Coast HSR.

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Appendix: Literature review of public infrastructure financing

Table 1: Definitions

Source	Scope	Aligned with study definitions?	Defines/ distinguishes terms	Comments /examples	Useful suggestions/ pointers
Vander Ploeg 2006	Full range of options at all state levels (Canada, overseas developments). Includes traditional and innovative tools.	Yes	Yes		Adds helpful further MECE dimensions, including delivery tools, three types of innovation: 'There are three types of innovation. First, governments can employ traditional tools, but simply use them differently (e.g., earmarking property taxes for capital purposes). Second, governments can employ new tools (e.g., tax-exempt bonds). Third, familiar methods can be applied to infrastructure systems to which they have not generally been applied in the past. This third option is the heart of innovative infrastructure finance' (p. 2). Includes a detailed taxonomy of urban infrastructure financing, funding and delivery tools.
Ernst & Young 2011	Not full range of options. Focus on funding role of superannuation industry in public infrastructure for Australia, compared to international examples.	Yes	Yes		Comprehensive definitions and making the point that concepts are often confused, with useful examples from media.
Chan <i>et al.</i> 2009	Full range of options, at all state levels. International review.	Yes - partially	Yes - partially	While study makes clear distinction between terms financing and funding, it is not always consistent with our study classifications (Refer Table 2 comments/examples).	Comprehensive definitions.
Brittain 2002	Full range of options, at municipal level for Canada, USA, and European jurisdictions.	No	No	Category 5, which is termed "funding", listed as a sub-category of "finance" instruments.	
Merna & Njiru 2002	Brief overview of full range of options across jurisdictions. Focuses remainder of	No	No	"... augment available public finance with private funds" (p.18)	

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Source	Scope	Aligned with study definitions?	Defines/ distinguishes terms	Comments /examples	Useful suggestions/ pointers
	chapters on methods where private finance is used.				
ACG 2003	Full range of options at municipal, state (NSW) and federal level (Australia, overseas developments).	No	No	Uses term 'financing options' on table listing five <u>funding</u> approaches listed in column 3 (p. 52).	
Kitchen 2004	Full range of options, at local government level.	No	No	'Governments fund capital expenditures from their own revenues and from external revenues" where instruments termed "financing" are discussed (p. 9)	
Ministry of Public Infrastructure Renewal 2004	Full range of options, at provincial level (Ontario, Canada). Includes research and best practices from other jurisdictions.	No	No	'Tax Increment Financing: Special levies or the incremental increase on taxes or user charges are used to fund infrastructure investment. (p.34)'	
de Alth & Rueben 2005	Full range of options at local government and state level (California).	No	No	'California uses pay-as-you-go funding...' and elsewhere pay-as-you-go described as financing method.	
Hanak & Rueben 2006	Compare range of traditional instruments with innovative instruments, at local government and state level (California) for transport and water.	No	No	"...state capital projects are now largely financed with bonds" (p.4), elsewhere "...spending cycles commonly associated with bond funding." (p.5).	
ACG 2007	Focussed on comparing PPPs to public funded/financed across all levels of state.	No	No	Does not draw a clear distinction between terms financing and funding. Uses these terms interchangeably; e.g. "government funded projects" (p.3) and later in same section "The taxpayers who underwrite the risk of a government-financed project". (p.3). More focused on the delivery mechanism, i.e. private versus public finance / funding and provision.	
Gannon & Smith 2009	Focus on PPPs in UK, as well as a re-examination of how public sector rail transport infrastructure should be funded in the UK. UK and	No	No	"grant funding" listed as a category on a spectrum of "finance" options (p. 5).	

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Source	Scope	Aligned with study definitions?	Defines/ distinguishes terms	Comments /examples	Useful suggestions/ pointers
	international review. At all levels of government, but focus on local government issues.				
GAO 2002	Current and newly proposed financing techniques at the time in US. At federal; state and local levels of government.	No	No	'FHWA uses the term "innovative finance" to refer to any funding measure other than grants to states appropriated from the Highway Trust Fund. Most of the innovative measures entail debt financing. The term is used to contrast that approach with traditional methods of funding highway projects.' (p.3)	

Table 2: Categorisation

Source	Categorisation approach	Aligned with study categories?	Comments /examples	Useful suggestions/ pointers
Vander Ploeg 2006	Distinguishes between three MECE dimensions with further categories per dimension: <ul style="list-style-type: none"> • Finance Tools <ul style="list-style-type: none"> – Pay-As-You-Go – Borrowing • Funding Tools <ul style="list-style-type: none"> – Taxation – User Fees • Delivery Tools <ul style="list-style-type: none"> – Public – Private – Public-Private Partnerships 	Yes		Classification adopted for our study. Adds helpful further MECE dimensions, incl. delivery tools, and three types of innovation: Includes a detailed taxonomy of urban infrastructure financing, funding and delivery tools.
ACG 2007	Two categories (termed "procurement" methods): Compares traditional government procurement to PPPs.	Yes		Categorises procurement methods, focused on the delivery mechanism, i.e. private versus public finance / funding and provision.
GAO 2002	Four categories. Termed "financing" mechanisms: <ul style="list-style-type: none"> • grants, • tax credit bonds, • tax-exempt bonds, 	Yes		While definitions were not consistent, what is termed financing in categories is consistent with our study definitions of "finance".

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Source	Categorisation approach	Aligned with study categories?	Comments /examples	Useful suggestions/ pointers
	<ul style="list-style-type: none"> direct federal loans. 			
Ernst & Young 2011	Select examples where superannuation can play a role, e.g. PPPs, Investment vehicles, e.g. Industry Funds Management, Privatisations.	NA	While definitions were consistent with study definitions, categorisation not considered as not a full categorisation or evaluation of options.	
Chan <i>et al.</i> 2009	Five categories (termed “ <u>financing</u> ” options): <ul style="list-style-type: none"> Budget appropriations Specific-purpose bonds (securitised borrowing) Off-budget financing by government businesses Development contributions Public–private partnerships (PPPs) or private finance initiatives (PFIs) 	No	While definitions of financing and funding are consistent with study definitions, appears to be some inconsistency in terms of categorisation when compared to study categories (per Vander Ploeg 2006) e.g. includes a delivery mechanism (PPPs/ PFIs) as a finance category.	
Brittain 2002	Five categories. Termed “finance” options: <ul style="list-style-type: none"> non-debt financing (reserve funding; Pay-As-You-Go/Direct Operating Contributions incl. Dedicated Revenues; User fees, Development Charges), traditional debt financing, “new” debt financing (User fees, Zero Coupon Bonds innovative financing (Leases), other potential funding options (targeted user charges). 	No	Categories include what our study defines as “funding” mechanisms under the financing instruments (e.g. “user fees” – which we define as a funding type included under non-debt financing options.)	
Merna & Njiru 2002	Three categories. Termed “ <u>finance</u> ” options: <ul style="list-style-type: none"> Public finance Private finance PPP 	No	Delivery mechanisms categorised as finance options.	
ACG 2003	Five types. Termed “funding” approaches: <ul style="list-style-type: none"> Government borrowing General taxes User charges Producer levies Special purpose vehicles 	No	Includes delivery mechanisms (SPVs) and finance options (e.g. government borrowing) under what our studies defines as funding approaches.	
Kitchen 2004	Two main categories. Termed “ <u>financing instruments</u> ”: <ul style="list-style-type: none"> Internal revenue sources <ul style="list-style-type: none"> General operating revenues Earmarked taxes 	No	Includes delivery mechanisms (e.g. PPP) and funding options (e.g. taxes) under finance options.	

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Source	Categorisation approach	Aligned with study categories?	Comments /examples	Useful suggestions/ pointers
	<ul style="list-style-type: none"> - Reserves - Special charges (e.g. development charges) • External revenue sources <ul style="list-style-type: none"> - Grants - Borrowing - PPP 			
Ministry of Public Infrastructure Renewal 2004	<p>Nine categories. Termed “infrastructure financing and procurement (IFP) models”:</p> <ul style="list-style-type: none"> • Traditional Capital Procurement • Design-Build • Operation/ Maintenance Service/Licence • Pooled Borrowing (special purpose entity); • Finance (bond issue or bank loan) • Lease • Design-Build-Operate • Design-Build-Finance- Operate • Design-Build-Own-Operate • Other <p>Apart from finance options inherent in above models, adds:</p> <ul style="list-style-type: none"> • Tax Increment Financing • Value Captured Charges • Revenue Bonds • Dedicated Taxes 	No	IFP models classification appears to be more based on the procurement/delivery mechanisms (e.g. various forms of PPP vs. public), rather than the finance aspects.	
de Alth & Rueben 2005	<p>Three categories (termed “<u>financing</u>” options):</p> <ul style="list-style-type: none"> • pay-as-you-go • leasing and private provision • borrowing 	No	Includes a delivery mechanism (private provision) as a finance mechanism.	
Hanak & Rueben 2006	<p>Two categories (mainly termed “<u>funding</u>” options)</p> <ul style="list-style-type: none"> • Innovative (e.g. PPPs; Design-Build; GO bonds) • Traditional (e.g. Design-Bid-Build) 	No	Classifies delivery mechanisms (e.g., PPPs) as funding mechanism.	
Gannon & Smith 2009	<p>Four categories. Termed “<u>funding</u>”:</p> <ul style="list-style-type: none"> • Revenue arising from fares and commercial activities; 	No	Includes a delivery mechanism, i.e. PPP; as well as a financing option (grants) under funding options.	

Source	Categorisation approach	Aligned with study categories?	Comments /examples	Useful suggestions/ pointers
	<ul style="list-style-type: none"> • Government grants collected in the form of taxes; • Betterment resulting from increased property and/or land values • PPPs 			

Table 3: Assessment types

Source	Nature of assessment	Useful suggestions/ pointers	Assessment findings
GAO 2002	Quantitative comparison/ evaluation	Comparison of total costs (appears to be accounting based costs, as opposed to economic costs): <i>“Estimates the costs that the federal, state or local governments (or special purpose entities they create) would incur if they financed \$10 billion in infrastructure investment using each of four alternative financing mechanisms.” (p. 14)</i>	Selects grant funding based on lower costs
ACG 2003	Qualitative and quantitative comparison/ evaluation	Qualitative evaluation based on framework of 7 criterion, namely effectiveness; efficiency; equity; stability/reliability of the revenue base; administration costs; compliance costs, certainty and transparency; and stakeholder support. Quantitative evaluation based on MONASH model of the Australian economy (MMRF) (gains from each approach in terms of NPV of GSP)	Qualitative assessment indicates no clear leader or best approach. Four approaches scored 5 out of a maximum score of 7— State taxes, municipal taxes (rates), debt and user charges. Quantitative evaluation concludes that debt funding is the optimal approach.
Kitchen 2004	Qualitative evaluation/ comparison	Qualitative evaluation based on 5 criteria: efficiency, accountability, transparency, fairness, and ease of administration. Strong reference to “benefits received model of public finance” ⁷ .	Answer depends on circumstances. Strong arguments for borrowing, bonds. Concludes that generally makes more economic sense (as future generations pays for it over lifetime, rather than upfront).
ACG 2007	Qualitative and quantitative comparison/ evaluation	Compared the performance of Public-Private-Partnerships (PPPs) and traditional procurement in terms of relative efficacy in relation to two criteria: cost and time over-runs. This was done by measuring the cost performance and timeliness outcomes relative to budget for the management and construction of public infrastructure projects. This study focuses on the delivery aspects as opposed to the merits of	PPP projects were not subject to optimism bias to the extent witnessed in traditional projects (“As a generalisation, it can be said that: Traditional projects were the subject of significant optimism bias, while at the contracting stage PPP projects were not subject to optimism bias.” (p. 20)

⁷ Principle that those who benefit from infrastructure should pay for it, resulting in more efficient use of resources, better accountability, increased transparency, and improved fairness(Kitchen 2004, p. 30).

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Source	Nature of assessment	Useful suggestions/ pointers	Assessment findings
		different financing alternatives and, therefore, has limited application in the development of a framework for evaluating financing alternatives for HSR	
Brittain 2002	Overview	Description of alternatives, some advantages and disadvantages.	No single method prescribed
Merna & Njiru 2002	Overview	Textbook with advantages, disadvantages. Practical considerations and commercial aspects.	No single method prescribed
de Alth & Rueben 2005	Overview	Short description of where alternatives usually used, as opposed to a direct comparison.	No selection
Hanak & Rueben 2006	Overview	Comparing innovation with traditional methods, rather than a full assessment of all possible methods. Proposes better alignment between costs and benefits. Suggests a set of considerations to aid selection of best alternative (p. 21).	No clear winners
Ernst & Young 2011	Overview	Overview of funding role of superannuation industry in public infrastructure for Australia compared to international examples.	Conclusion: No comparison/ evaluation. Concludes with recommendation of policy improvements to maximise superannuation industry participation in public infrastructure for Australia,
Gannon & Smith 2009	Overview	Pros and Cons, overview of PPPs. Not an evaluation of broad spectrum of alternatives. PPP focussed.	No selection
Ministry of Public Infrastructure Renewal 2004	Framework & overview	Not an evaluation, but rather a framework for identification and selection of capital raising alternatives in terms guiding principles, selection criteria and an evaluation process. Includes a short overview of infrastructure planning, financing and procurement models.	No conclusion, but the process of evaluation.
Vander Ploeg 2006	Framework & overview	Decision-making framework provided which links financing, funding and delivery model to characteristics of infrastructure, incl. size; up-front costs; and complexity. Detailed overview of the tools, reviewing advantages, disadvantages, winning conditions (key success factors) and applications of each tool.	No clear selection instead identifies a set of “promising tools” at the time.
Chan <i>et al.</i> 2009	Framework & overview	Provides a framework of interaction between efficiency in investment, finance and funding. Provides overview of on three aspects per category: <ul style="list-style-type: none"> • Applications and trends • Policy issues • Strengths and weaknesses 	No clear selection, instead ... <i>“This study explores the scope for efficient financing to reduce the life-time cost of an infrastructure project and the potential financing vehicles have to improve the investment decision. It does not attempt an overall comparative assessment of financing vehicles — many legal, institutional, market environment and project specific factors have to be weighed in making such judgements. Instead, it reports on the experiences of a number of countries following different approaches to help provide an assessment of the strengths and weaknesses of the different alternatives.”</i> (p. XVIII)

Table 4: Financing alternatives

a. Pay-as-you-go (PAYGO)	
<p>Description: Purchasing or constructing only those capital assets made possible by financial resources currently at the developer's disposal. This may include cash in the capital budget, savings in reserves and reserve funds, or other cash on hand (Vander Ploeg 2006). '<i>Public PAYGO financing essentially takes current revenues—taxes, user fees, and grants collected in the current fiscal year—and applies them directly to current capital expenditures for the same year. Savings gathered over time are also used as a source of funds</i>' (Vander Ploeg 2006, p.37). Examples: Transfers to capital from current revenues, intergovernmental grants and contributions, reserves and reserve funds as well as budget appropriations financed on a PAYGO basis (Vander Ploeg 2006).</p>	
<p>Arguments of proponents:</p> <ul style="list-style-type: none"> • <u>Least expensive</u> option, avoids costs of interest on debt (Chan <i>et al.</i> 2009; Vander Ploeg 2006). • Considered <u>most fiscally responsible</u> approach - spend only what developer can currently afford (Chan <i>et al.</i> 2009; Vander Ploeg 2006). • <u>Maintains fiscal flexibility</u>: Keeps bond ratings intact and preserves borrowing capacity (Vander Ploeg 2006). 	<p>Arguments of opponents:</p> <ul style="list-style-type: none"> • Requires <u>large up-front capital outlays</u>, often resulting in <u>unnecessary delays</u> in major infrastructure investments and associated opportunity costs. Resultant inflation could offset interest savings (Chan <i>et al.</i> 2009; Vander Ploeg 2006). • <u>Competes</u> with other expenditures for scarce general fund revenues (Vander Ploeg 2006). • <u>Lacks intergenerational equity</u>, imposes full costs on the current generation of users (Vander Ploeg 2006). • When finances provided exceed economic spill-overs, it is likely to lead to a range of <u>economic distortions</u> (Kitchen 2004).
b. Capital-market financing	
<p>Description: Chan <i>et al.</i> (2009) defines capital-market financing, as 'financing based on borrowings or equity contributions from private sources.' Borrowings in turn are defined as a source of instant funds by capitalizing future cash flows to the present and then repaying these funds, plus interest, over the life of the asset (Vander Ploeg 2006). Borrowing is usually favoured when current revenues are insufficient to finance expenditures on a PAYGO basis (Kitchen 2004) and consists of general purpose borrowing and specific-purpose securitised borrowing⁸ [often secured on the asset, or against the revenue stream arising from the asset (Chan <i>et al.</i> 2009)]. Examples: General obligation bonds, revenue bonds, tax-exempt bonds, borrowing against reserves, tax incremental finance-backed bonds and senior government credit enhancement (Kitchen 2004, Vander Ploeg 2006). Recent innovations include the use of infrastructure revolving funds and infrastructure banks, as well as the use of smart debt (Vander Ploeg 2006). In Australia, public borrowing is undertaken through bonds issued by central borrowing authorities (CBAs) in each jurisdiction, such as the NSW Treasury Finance Corporation. The use of public debt to finance infrastructure may occur by either budget entities or off-budget entities and may be issued on the domestic or overseas markets (ACG 2003). The private sector can also make equity contributions to a project. This may occur through financial intermediaries (often a consortium of banks with a lead investment bank), or other institutional investors (for example, superannuation funds or insurance companies), or by retail investors purchasing instruments issued to finance the infrastructure asset, or through both listed and unlisted infrastructure trusts (Chan <i>et al.</i> 2009)⁹.</p>	
<p>Arguments of proponents:</p> <ul style="list-style-type: none"> • <u>Smooths investments</u> by spreading the costs over time, and when the term of 	<p>Arguments of opponents:</p> <ul style="list-style-type: none"> • <u>Increased financing cost</u> associated with interest charges, although might be

⁸ Whilst popular in countries such as the US and Canada, specific purpose bonds were phase out in Australia in the mid 1980s (Chan *et al.* 2009, p. XXVI)

⁹ Chan appears to confuse direct and indirect investment and primary and secondary market instruments.

<p>the borrowing matches both the economic and physical life of an infrastructure asset, debt-finance can be both <u>effective</u> and <u>efficient</u> (Dowall 2000 in Vander Ploeg 2006; ACG 2003).</p> <ul style="list-style-type: none"> • Creates better <u>intergenerational equity</u>; synchronises costs and benefits of long-lived infrastructure assets – those who benefit from the facility pay the costs of the project (Kitchen 2004, Chan <i>et al.</i> 2009, Vander Ploeg 2006; ACG 2003). • <u>Immediacy</u> of borrowing allows developer to <u>move rapidly</u> and meet increasing demands, as opposed to deferring investment until enough PAYGO funds have accumulated (Vander Ploeg 2006). • <u>Frees up funds</u> for infrastructure that is better financed under a PAYGO approach (Vander Ploeg 2006). • <u>Stable and reliable</u> source of funds when a well functioning debt management program is in place (ACG 2003). • Well established and efficient debt management approaches by reputable financial institutions (like the NSW Treasury Corporation) is also characterised by <u>low administration costs</u> for raising debt (ACG 2003). • Associated with very <u>little compliance costs</u>, as debt instruments generally involve minimal risk and are well understood (ACG 2003). • Widespread adoption of accrual accounts has increased <u>transparency</u>, provided there is a clear distinction between increased debt and increased assets for infrastructure investments (ACG 2003). 	<p>significantly offset by inflation, population growth and future economic expansion for long-term debt (Kitchen 2004, Vander Ploeg 2006). Similarly, an equity premium¹⁰ is required by private equity investors (Chan <i>et al.</i> 2009).</p> <ul style="list-style-type: none"> • <u>Public debt competes and crowds out private investment</u> by increasing the costs of financial capital¹¹ (Vander Ploeg 2006). • <u>Concerns around the intergenerational equity</u> benefit of public debt, as future users have no say in the issuance of today's debt, yet they are burdened with projects approved by today's decision-makers (Kitchen 2004). Especially problematic if projects turn out to be uneconomical (Chan <i>et al.</i> 2009). • Negative consequences of <u>excessive levels of public debt</u>¹² including <u>adverse credit ratings; higher interest rates; reduced investment and inflation</u> (Vander Ploeg 2006, Chan <i>et al.</i> 2009). • If financial markets interpret increased public debt as a <u>sign of improper fiscal management</u>, stakeholder support can be expected to decline, carrying with it <u>political and economic risks</u> (ACG 2003, Vander Ploeg 2006)¹³. The use of public debt is politically unpopular in Australia (Kee & Forrer 2002 and Edwards 2006). • Can distort incentives for efficiency (Chan <i>et al.</i> 2009)
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¹⁰The excess return that an individual stock, or the overall stock market, provides over a risk-free rate. Since a higher rate of return is required to entice investors to accept riskier investments, the equity premium effectively compensates investors participating in the equity market' (Chan *et al.* 2009, p. 9).

¹¹Counter arguments exist in case of infrastructure, as opposed to a structural and ongoing government operating budget shortfall. 'Whether infrastructure is developed with borrowing by the public or the private sector, the same amount of capital is required (Yates 2002). Furthermore, the private sector needs public infrastructure. Without it, the private sector's investments will be less productive' (Vander Ploeg 2006, p. 54).

¹²Borrowing is considered excessive when growth becomes unsustainable, especially when considering tax supported debt. Borrowing '...can be considered excessive and unsustainable if levels of tax supported debt are steadily increasing, year after year, at a rate above the growth in operating revenues out of which the interest and principal must be repaid. Eventually, this will result in higher taxes down the road, particularly if the assessment base and personal incomes are not expanding sufficiently to accommodate the steadily rising debt levels. Continually increasing levels of tax supported debt that are growing faster than tax revenues will also begin squeezing out other program and future capital priorities and also reduce the amount of discretionary spending in the operating budget ...To mitigate these concerns, governments need to strike a balance with debt. Too little debt can severely restrict the funds available for financing infrastructure, while too much debt is fiscally unsustainable over the long-term. Prudence requires finding the mid-point' (Vander Ploeg 2006, p. 54). Given Australia's current debt levels, however, the dangers of excessive debt have limited local applicability (ACG 2003).

¹³But where fiscal management is not at risk, analysts are increasingly voicing their disapproval of a blanket "no-debt policy" as adopted in the NSW state government, linking it with inadequate infrastructure (ACG 2003, Vander Ploeg 2006).