Implementing Value Capture for Transport Infrastructure

Applicability for South-East Queensland

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Under Guidance of

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Disclaimer
Report completed as part of coursework for Bachelor of Economics at the University of Queensland (ECON3900: Project Based Learning), under the supervision of Professor Flavio Menezes.

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ABBREVIATIONS

BCC – Brisbane City Council
BRS – Business Rates Supplement
BRT – Bus Rapid Transit
CIL – Community Infrastructure Levy
CRR – Cross River Rail
CTIC – City Transport Improvement Charge
DFT – Department for Transport
DID – Difference-in-Differences
EPOI – Economic Point of Interest
GCC – Gold Coast City Council
HPM – Hedonic Price Model
MBA – Marginal Benefit of Accessibility
NNDR – National Non-Domestic Rates
OVB – Omitted Variable Bias
SEQ – South-East Queensland
TfL – Transport for London
TIF – Tax Increment Financing
Executive Summary

A practical path for implementing value capture in South-East Queensland has remained largely unexamined despite its popularity as a solution to fund infrastructure in Australia. Our contribution to the discourse is a framework examining how transport infrastructure generates value to land as well as an analysis of international approaches of value capture. In this report we make the case for evidence-based value capture policy, introduce methods to measure value accrual, and options to capture it.

We have developed a framework of how transport infrastructure generates value to land. This can aid the policy maker in understanding how benefit is accrued, and aims to assist in delivering a targeted value capture solution. Value uplift due to transport infrastructure is equal to the added benefit of accessibility to an economic point of interest (EPOI). This definition allows us to infer several theoretical concepts regarding value uplift. First, is that value uplift increases as land gets closer to the station. This relationship does not hold in the immediate proximity of the station as negative effects of transport infrastructure lower value uplift. Second, is the notion that an additional connection will generate less value uplift in an area that is well-connected (i.e. very accessible to EPOIs) than a poorly-connected area. Third, is the concept that for a given project, land further from an EPOI will see greater value uplift than land closer to the EPOI. Lastly, commercial property will experience greater value uplift than residential, however this uplift will be more concentrated around the access point.

We then consider a case study to demonstrate how value capture has worked in practice, whether it has been successful, and what lessons can be applied to Brisbane. We chose London Crossrail for the case study as it is a well-recognised project that uses a common method of conducting value capture. London Crossrail uses a combination of a rates uplift (the Business Rate Supplement Scheme (BRS)) and developer taxes (the Mayoral Community Infrastructure Levy and Developer Contributions) to fund approximately 32% of the project capital. The BRS Scheme will provide the majority of the funding, raising £4.1 billion of the capital cost. We show that the London case uses the principle of collecting a small amount from a large group and does so efficaciously and efficiently.

We then look at additional international examples of value capture and the issues surrounding each case. Using these cases, we can postulate that a positive relationship exists between the population density of a city and the percent of a project that you can fund with value capture. Using Brisbane City Council rates, we apply London’s Crossrail BRS scheme to Brisbane. We find that the same tax could only raise up to 2% of Cross River Rail’s funding needs. Hence, a more sophisticated approach is needed to fund a significant amount of Cross River Rail.

Exploring these more refined approaches we found that if governments have access to information about where value is generated, they can design evidence-based policy that will be more effective and equitable. The challenge in using evidence-based policy-making for value capture is isolating and estimating the effect that infrastructure has had on land values. The most frequently used ‘impact evaluation’ techniques assess the impact of transportation infrastructure on property/land values with Hedonic Price Models, and more recently with Difference-in-Differences Estimators. The Difference-in-Differences estimator can be used to measure what effect a project has had on different parties, in different locations, and when the value has been seen. Hedonic Pricing models can measure and predict value uplift, however, they do not observe the timing of value accrual. There is no ‘one
size fits all’ solution to impact evaluation for value capture, however, with an understanding of the techniques and their strengths and limitations, we can decide which is most applicable to the data, objectives and specifics of the project.

We then discuss Taxation Increment Financing (TIF), a mechanism which has frequently been discussed within the context of value capture. It has the benefit of being useful when impact evaluations are not possible as it does not involve measuring value accrual. However, in TIF, all value uplift is attributed to the infrastructure and does not isolate its effect. TIF use has slowed in recent years, and its effectiveness has been called into question. Projects using TIF have often failed to generate employment, business and real estate activity; as a result, municipalities have seen fiscal strain as the burden of the debt has fallen on them. This report also addresses the misconception that TIF will add additional revenue and diversify funding sources. Only by introducing/increasing tax rates can revenue rise, as TIF simply allocates a portion of revenue to repayment of the debt.

We then consider the different policy options available to capture value uplift. We categorise these options as either ex-ante methods, where the value is captured at the implementation of the tax or an ex-post tax where the value is collected over a specified life. We consider the merits of each method and find that by broadening the tax base of an ex-post land tax, it has the potential to recover a much larger percentage of a project’s cost than ex-ante methods. With the aim of only capturing a proportion of the total value uplift, a land tax scheme has the potential to recover a significant percentage of a project’s cost while also leaving benefit for landowners. By using a worked example with land value uplift of 3-7% around the Cross River Rail project, we suggest the combination of a lump sum charge applied to the network and a special flat rate applied to certain landowners could generate $33.5m-$45.1m annually. By implementing this strategy over a thirty-year timeframe, we show that 14.5%-19.5% of the total project cost could be recovered while still leaving substantial benefit to landowners.
1.0. Context

In Australia, cities contribute nearly 80% of national GDP\(^1\), and the World Bank estimates that human capital accounts for more of Australia’s wealth than double that of produced and natural wealth combined.\(^2\) There is significant pressure for transport infrastructure that will sustain and grow output into the future. Estimates indicate that the four largest Australian cities will need to accommodate 5.9 million more people in the next 20 years, and with 4 out of 5 projects on the 2016 Infrastructure Australia high priority list aimed at easing urban congestion\(^3\), the need for transport infrastructure is rising.

Citibank and Infrastructure Partnerships Australia estimates Australia’s infrastructure funding deficit at approximately $700 billion\(^4\), and Infrastructure Australia states, “... under current arrangements, governments do not have sufficient headroom on their budgets to fund the level of infrastructure required.”\(^5\) This is indicative of the growing pressure to reshape current funding models. See Box 1.1 for the distinction between funding and financing.

<table>
<thead>
<tr>
<th>Box 1.1 Funding vs. Financing</th>
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<tr>
<td><strong>Funding</strong> refers to the sources of revenue being used to pay for infrastructure. It reflects who ultimately pays for the infrastructure to be built and maintained over its lifetime. Public transport fares are a funding source which directly charges the users of the project. However, most funding for public transport infrastructure comes from the community through general taxation.(^6)</td>
</tr>
<tr>
<td><strong>Financing</strong> refers to the financial tools that can be used to pay for the infrastructure (i.e. bonds, equity, capital leasing).(^7)</td>
</tr>
</tbody>
</table>

Infrastructure that will support the growth of Australian cities will require funding mechanisms that are adequately diversified and reliable to meet future challenges and opportunities. Value capture has become prominent in the funding conversation as an innovative solution. Despite this, Menezes makes the argument that value capture is a not an innovative solution, and can be considered a time-tested source of funding\(^8\). Value capture has been used in Australia since the 1920s in the form of betterment taxes and improvement levies. Using betterment taxes, the New South Wales Government was able to fund a third of the total cost of the Sydney Harbour Bridge.\(^9\)

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\(^1\) The Department of Infrastructure and Transport, “Our Cities, Our Future- A national urban policy for a productive, sustainable and liveable future”, (2011).


\(^3\) Infrastructure Australia, “Australian Infrastructure Plan”, (2016).

\(^4\) PricewaterhouseCoopers, “Funding Australia’s Infrastructure”, (2014).


\(^9\) Prosper Australia Research Institute, “Value Capture- a historical perspective”. 

Value capture is a funding tool that aims to capture benefits of public infrastructure, to then use these benefits to fund the project. Some of the benefits of infrastructure are already captured by government, such as increased revenue from income taxes, decreased welfare spending, as well as revenue from transport fares (see Box 1.2). Additionally, value accrues to private parties such as land owners, which government is able to capture through rates and land tax.

There are two major limitations with using existing land taxation for value capture. Firstly, while there is an increase in tax revenue this increase is not always allocated to infrastructure funding. Secondly, only a small percentage of value uplift is able to be captured.

**Box 1.2 How Government Already Captures Value**

Government currently captures some of the benefits of transport infrastructure, however, these revenue streams are not directly used to fund transport infrastructure projects. Benefits due to increased employment and education opportunities are captured through increases in income tax revenue, as well as decreases in welfare payments. Similarly, increased opportunities for consumption and leisure are captured through increases in GST revenue.

More directly is how Government recoups some of the benefits of public transport by fare-box revenue, and road usage through tolls. Additionally, a portion of land value uplift is captured through land taxes.

Current methods for funding infrastructure have been criticised as being inequitable. This inequity arises from the entire set of taxpayers subsidising a transport infrastructure project, even though only a small portion of them will see benefit. Infrastructure Australia has stated that this imbalance between the user and the taxpayer should be fairer and that direct users should make a greater contribution to funding. For public transport, the gap between what users pay and the cost of provision is especially acute. Brisbane recovers less than 25% of operating costs from fares (Figure 1.1), relying on substantial taxpayer subsidies to fund operating costs.

![Figure 1.1 Percentage of Operating Costs Covered by Fares](image)

10 Infrastructure Australia, “Funding”, (2016).
Therefore, for infrastructure built in Brisbane, taxpayers generally fully fund the capital costs of infrastructure and the majority of the operating costs. Project costs for the Brisbane Cross River Rail total $5.4b, of which 50% comprise capital costs and 44% comprise operating costs.

However, if public transport fares were to rise in order to fund a greater percentage of an infrastructure project, there would be two major limitations; affordability, and the flow-on effects of expensive public transport. Low-income commuters tend to be much more dependent on public transport (Figure 1.2) and also tend to be located further from the CBD\textsuperscript{13}, suggesting that the cost of a fare increase to fund infrastructure would likely be disproportionately borne by lower income individuals.

\[\text{Figure 1.2 Public transport users by personal income in Sydney}\textsuperscript{14}\]

Secondly, lower transport fares for the economically disadvantaged have benefits such as lower fare evasion rates and higher workforce participation, which impact productivity, tax revenue and welfare costs.\textsuperscript{15} According to a nationwide survey\textsuperscript{16} conducted by Canstar Blue, 74% of Queensland respondents believe “...it is cheaper to drive than utilise TransLink services.” If public transport fares were to increase in a bid to fund infrastructure, this would likely urge even more residents to switch from public transport to private, thereby reducing the efficacy of this method.

Value capture, in contrast to public transport fares, funds projects by targeting externalities created by transport infrastructure (i.e. land uplift). Improving connectivity can increase the value of affected land in that area. It is up to government to determine how much of this value will be captured. The mechanisms by which value generation occurs, methods to measure this uplift, and how this tool can be implemented in South-East Queensland will be discussed in the following sections.

\textsuperscript{16} Canstar Blue, “Is it cheaper to catch public transport or drive,” (2015).
2.0. Economics of Value Generation

This section intends to provide a theoretical framework for how transport infrastructure adds value to land. This will allow projects to be assessed on a case-by-case basis for the potential gains they may be capable of providing, and whether value capture will be suitable.

An analysis of how value is generated also allows the policy maker to deliver a more targeted value capture solution. This is achieved by looking at how value uplift is distributed to different parties, depending on a range of variables. These include the proximity to the transport access point, the location of the project, and the land use of the site.

This distributional analysis may have applications for use in cost-benefit analysis for the infrastructure project. Estimated value uplift, based on this theoretical framework and measurement techniques (see section 4.0, can be derived and used to evaluate whether the infrastructure provides enough benefits to outweigh its costs.

It is necessary to establish some first principles in order to analyse value capture. First, the demand for transport infrastructure is a derived demand, where true demand arises from a need for accessibility to economic points of interest (EPOI) (see Box 2.1). Benefit is accrued to those that directly utilise the infrastructure, as well as those that can benefit from network improvements the transport infrastructure may provide.

Box 2.1 - Benefits of Accessibility to EPOIs

<table>
<thead>
<tr>
<th>Benefits of Accessibility to EPOIs</th>
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</thead>
<tbody>
<tr>
<td>EPOIs host employment and education opportunities, as well as centres for leisure and consumption. Improving accessibility to EPOIs with infrastructure benefits its direct users, as well as the wider network.</td>
</tr>
<tr>
<td>Direct users are benefitted through increased opportunities for education, employment, and leisure, and/or decreased travel time to these destinations. Transport infrastructure can also benefit the broader network by decreasing pollution and easing congestion.</td>
</tr>
</tbody>
</table>

It is also important to recognise that value capture is already undertaken by government. Benefits of infrastructure are able to be recaptured directly through user charges, and inadvertently through increased tax revenue. This report will be focussed on the latter, more specifically, on the value accrued to land owners.

Infrastructure projects, through the demand mechanism seen in Figure 2.1, create a value uplift on land. This demand mechanism recognises that the demand for land is partially driven by how well connected it may be to the user’s EPOIs, and that users will be willing to pay for this added accessibility. Therefore, this value increase, leaving all other things equal, will be equivalent to the perceived added benefit of accessibility that the transport infrastructure provides. It is this benefit that a value capture mechanism aims to recapture.
This demand mechanism can be used to show a relationship between the distance to an access point of the transport infrastructure (e.g. a train/bus station) and value uplift. In general, the further one lives from the station, the less benefit of accessibility they receive. However, this relationship between distance to station and value uplift does not hold for all land. Negative effects of transport infrastructure, such as noise and air pollution, as well as increase in crime, are concentrated at access points. As a result, value uplift closest to the station may not be as significant as land further away (Figure 2.2). Empirical evidence of this effect is well documented and some notable examples of this in the literature are detailed in Table 2.1.
Table 2.1 Empirical Research: Effect of Distance to Station on Property Value Uplift

<table>
<thead>
<tr>
<th>Observed Effect</th>
<th>Mode - City</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Evidence that properties within a 100m buffer experience significantly lower</td>
<td>BRT – Parramatta, Australia</td>
</tr>
<tr>
<td>price increase than properties between 1200-1600m.”17</td>
<td></td>
</tr>
<tr>
<td>Dwellings located within 500m of the expected location of the metro stations</td>
<td>Heavy Rail - Thessaloniki, Greece</td>
</tr>
<tr>
<td>have a lower purchase price18</td>
<td></td>
</tr>
<tr>
<td>Value uplift is negative for residential property located within 500m of the</td>
<td>Dubai Metro – Dubai, UAE</td>
</tr>
<tr>
<td>Metro station.19</td>
<td></td>
</tr>
<tr>
<td>“It is attractive for residents to live near, but not in immediate proximity to</td>
<td>Heavy Rail - Hamburg, Germany</td>
</tr>
<tr>
<td>railway stations”20</td>
<td></td>
</tr>
</tbody>
</table>

Another key consideration for value capture is the Marginal Benefit of Accessibility (MBA). As an example, consider a connection between Point A and an EPOI. The first connection between the points will provide the largest benefit, and each connection after this will likely add less benefit than the first (Figure 2.3). This relationship is also observed empirically, as shown in (Table 2.2).

![Figure 2.3 Marginal Benefit of Accessibility](image)

Table 2.2- Empirical Research: Marginal Benefit of Accessibility

<table>
<thead>
<tr>
<th>Observed Effect</th>
<th>City</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Inclusion of other accessibility factors (highway, freeway) in the underlying</td>
<td>Various (57 separate locations)</td>
</tr>
<tr>
<td>studies significantly reduces the level of the reported station impact on</td>
<td></td>
</tr>
<tr>
<td>property values”21</td>
<td></td>
</tr>
<tr>
<td>Value uplift lower than those determined by most other previous studies, which</td>
<td>Hamburg, Germany</td>
</tr>
<tr>
<td>is attributed to the generally high level of accessibility in the Hamburg area</td>
<td></td>
</tr>
<tr>
<td>compared to the areas in other studies.22</td>
<td></td>
</tr>
</tbody>
</table>

The effects of MBA are best seen in the relationship between value uplift and distance to EPOI. As distance to EPOI increases, it is probable that less existing transport options are available, hence, if a transport infrastructure project is placed in this area, it is likely to have a higher value uplift than if it was placed closer to the EPOI. Conversely, as distance to EPOI increases, population decreases. The implication of these competing relationships is that value uplift will likely be largest at a distance from the EPOI that optimises these two factors (Figure 2.4).

The difference between residential and commercial land also plays an important role in value generation. They both accrue benefit due to accessibility, however, their magnitudes and distributional effects with respect to distance to station differ greatly. Residential properties tend to have benefits that accrue to land further from the station than commercial properties, however, commercial properties experience much larger value uplift, albeit concentrated closer to the station (Figure 2.5). Additionally, commercial land experiences less disutility effects than residential property, further increasing value uplift relative to residential property. Empirical research has also observed this effect, as detailed in Table 2.2.
Implementing Value Capture for Transport Infrastructure

Although this relationship between value uplift and transport infrastructure is fairly robust, some exceptions to the rule exist. Notable examples of this in the literature include a study by Cervero & Duncan (2002) in Los Angeles, which found inconsistent impacts of value generation for BRT across affected areas. Additionally, an investigation into the impacts of Liverpool-Parramatta BRT in Sydney found no evidence of value uplift in affected areas. These examples form a very small percentage of studies that find no evidence of value uplift.

Value uplift with respect to time is another element that should be taken into account when implementing value capture. The Center for Transit Oriented Development (CfTOD) provides a theoretical value uplift (referred to as premium) curve for different stages of the infrastructure's life-cycle (Figure 2.6). This theoretical model implies that expectations of the benefits of transport infrastructure lead to all value uplift accruing prior to the opening of the infrastructure. Future growth due to the infrastructure will only occur due to enhancements of the existing infrastructure, such as network expansions.

<table>
<thead>
<tr>
<th>Observed Effect</th>
<th>City</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land price premiums of up to 10% estimated for residences within 300m of Bus Rapid Transit (BRT) station, and more than 25% for retail over a smaller impact zone of 150m.</td>
<td>Seoul, South Korea</td>
</tr>
<tr>
<td>On average, commercial properties within ¼ mile of the railway station sell/rent 12.2% higher than residential properties in the same distance range.</td>
<td>Various (57 separate locations)</td>
</tr>
</tbody>
</table>

Although this relationship between value uplift and transport infrastructure is fairly robust, some exceptions to the rule exist. Notable examples of this in the literature include a study by Cervero & Duncan (2002) in Los Angeles, which found inconsistent impacts of value generation for BRT across affected areas. Additionally, an investigation into the impacts of Liverpool-Parramatta BRT in Sydney found no evidence of value uplift in affected areas. These examples form a very small percentage of studies that find no evidence of value uplift.

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![Figure 2.6 Theoretical Value Curve from Transit Infrastructure](image)

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Empirical evidence of this effect has been seen in Perth, Australia for the implementation of a Heavy Rail project (Figure 2.7). Value uplift declines following the commencement of operations, possibly due to the negative effects of the heavy rail line. This effect is especially true for land within 400m of the station.

![Figure 2.7 Empirical Evidence: Time Dependence of Value Uplift - Perth, Australia](image)

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28 McIntosh, Trubka & Newman, “Can value capture work in a car dependent city? Willingness to pay for transit access in Perth, Western Australia,” 323.
3.0. Case Study: London Crossrail

To highlight how value capture works in practice, a detailed case study of London Crossrail has been conducted. The purpose of the case study is to analyse an international example of value capture and the way it is implemented to increase understanding of the intricacies of value capture in practice. The goal is to learn from these international examples and apply relevant findings to Brisbane.

The London Crossrail project was selected for a few reasons; it is a large and current project that is routinely considered when evaluating value capture and its efficacy, and it uses one of the most common forms of value capture, a rates uplift. For these reasons, it is useful to compare and contrast the London Crossrail project with how value capture could work in Brisbane and whether comparable outcomes could be achieved.

London Crossrail has a long history with the first proposals for an east-west link crossing central London being made in the 1880’s. Several reincarnations were proposed over the next 120 years. However, they were either tabled in favour of alternative lines or rejected. Over the last decade support for the project continually grew and in 2005 the Crossrail Bill was introduced and passed through parliament. Following this, the statutory body Crossrail Limited was created (Box 3.1), and the funding package was secured in 2007, further revised in 2010, and in 2012 construction of the project began.

Box 3.1 Statutory Authority

Creating a statutory body for an infrastructure program has many advantages. As suggested by the Queensland Treasury the statutory body form is generally used when there is a need for:

- some operational independence from the State Government
- funding arrangements that are not reliant on the annual appropriations processes
- specific expertise on a governing board, or
- a separate legal entity\(^{29}\)

As large scale infrastructure projects such as Crossrail usually have multiple government stakeholders, the separate legal status, and operational independence is useful as it allows Crossrail Limited to complete the project without having to go to the separate authorities for minor approval. The statutory body Crossrail Limited was created under The Crossrail Act (2008) with the purpose of coordinating the delivery of London Crossrail. The act gave the body the ability to resume land, to spend funds appropriated by the separate

departments, issue bonds to cover capital costs. The figure below specifies the funding provided by each party.

![Crossrail funding structure](image)

**Figure 3.2 Crossrail funding structure**

Listed below are the stakeholders of the London Crossrail and their relationships to the Crossrail Limited body.

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Role</th>
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<tr>
<td>Department for Transport</td>
<td>Joint sponsor and funder</td>
</tr>
<tr>
<td>Transport for London</td>
<td>Joint sponsor and funder</td>
</tr>
<tr>
<td>Crossrail Limited</td>
<td>Wholly-owned subsidiary of Transport for London, delivering the Crossrail programme</td>
</tr>
<tr>
<td>Crossrail Project Representative</td>
<td>A senior engineer, supported by a small team, who challenges and reviews Crossrail Limited’s progress with the programme, and reports to the joint sponsors</td>
</tr>
<tr>
<td>Network Rail</td>
<td>Financing the surface works through borrowing which will primarily be repaid by fees from the Crossrail train operating company. Network Rail is also a contractor to Crossrail Limited for the construction of the eastern and western surface sections in addition to its wider responsibility for the national rail network</td>
</tr>
<tr>
<td>Bechtel</td>
<td>Project management contractor, working with Crossrail Limited to oversee construction of the central, tunnelled section</td>
</tr>
<tr>
<td>Transend (joint venture between AECOM, CH2M Hill and Nichols Group)</td>
<td>Project management contractor, working with Crossrail Limited to oversee the overall Crossrail programme</td>
</tr>
<tr>
<td>City of London Corporation</td>
<td>Agreed to contribute funding towards Crossrail</td>
</tr>
<tr>
<td>Heathrow Airport Limited</td>
<td></td>
</tr>
<tr>
<td>Canary Wharf Group</td>
<td>Contributing towards the construction of the Crossrail station at Canary Wharf</td>
</tr>
<tr>
<td>Berkeley Homes</td>
<td>Contributing towards the funding of the Crossrail station at Woolwich</td>
</tr>
<tr>
<td>Office of Rail Regulation</td>
<td>Regulating Network Rail</td>
</tr>
</tbody>
</table>

**Figure 3.3 Crossrail Limited’s Stakeholders**

Under current estimates, London Crossrail will cost £14.8 billion to deliver with the first stage of the project scheduled to be completed in 2017. The first services through central London are expected to begin in 2018, and the final stages will be finalised by December 2019. London Crossrail is estimated

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31 Ibid., 15.
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to increase central London’s rail capacity by 10% while reducing the congestion at many of London’s key underground stations. It is currently the largest infrastructure project in Europe with over 10,000 employees working on 40 construction sites throughout London.\(^{32}\)

London Crossrail has used a combination of value capture mechanisms to fund £4.8 billion of the project costs, which equate to approximately 32% of the projects funding needs. These include a Business Rate Supplement scheme, a Mayoral Community Infrastructure Levy, and Developer Contributions. It is important to note that while it is not expressly recognised as such, London has also used a form of ex-ante value capture through the sale of surplus land and property (this concept is discussed further in section 5).

London’s primary form of value capture for Crossrail is the Business Rates Supplement (BRS) Scheme. The BRS scheme is a form of rates uplift that will raise £4.1 billion in funds which represent the majority of funds being contributed from value capture. The BRS scheme is a 2% tax on commercial properties in each of the 32 Burroughs of London with a rateable value over £55,000. The rateable value of a property is the value that the owner would receive if they leased out the property today and it is re-evaluated by the council every five years. With the current £55,000 hurdle, only the top 20% of London’s commercial properties are liable to pay the BRS. The BRS scheme began in 2010 and will have a life of 30-years, with the possibility of an early termination if the funding needs are met before the life of the tax is reached.\(^{33}\)

<table>
<thead>
<tr>
<th>Box 3.2 What is a successful tax?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Efficiency</strong></td>
</tr>
<tr>
<td>An efficient tax is one that raises revenue while minimizing the distortions on the decisions of agents within a market resulting in a deadweight loss. Some taxes such as stamp duty grossly distort the investment decisions of interested parties by disincentivising the sale of property.</td>
</tr>
<tr>
<td><strong>Equity</strong></td>
</tr>
<tr>
<td>While a particular tax option may be efficient, it may fall heavily on lower-income earners who may find it hard to meet payments even with a windfall gain in land-rent. This is a particularly important criterion to assess because the intention of infrastructure projects is to create a public good. The principle of value capture is to help fund this public good through taxing excess economic rent, not creating a large tax burden on lower-income earners.</td>
</tr>
<tr>
<td><strong>Efficacy</strong></td>
</tr>
<tr>
<td>The final and often the most important criterion for policy makers is whether a tax is efficacious. This criterion considers whether a tax will be easy to implement (i.e. low administrative cost) and whether it can raise a predictable and consistent amount of funds for the infrastructure project.</td>
</tr>
</tbody>
</table>

The BRS has several benefits which make it both a efficacious and relatively efficient (see Box 3.2) tax scheme when compared to the other value capture mechanisms used for Crossrail. The BRS only takes a small amount from a large pool of businesses across London’s 32 Burroughs which means there is only a small cost for each party. As suggested by Johansson, A. et al (2008) taxes on land and property are argued to be more efficient than other taxes because they do not affect agents’ decisions to supply

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\(^{33}\) Greater London Authority, “Intention to levy a business rate supplement to finance the Greater London Authority’s contribution to the Crossrail project: Final Prospectus,” (2010).
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labour, invest or produce as much as other taxes. Although the BRS is calculated on rateable value and not land value it behaves similar to a land tax because the rateable value is based on some of the immovable features of the property such as location. Another benefit of the BRS is that due to its five-year recalculation of rateable value, the volatility of the tax revenue stream is reduced in a low inflation environment especially like the one observed over the last few years. This revenue stream volatility is further reduced by the provision in the BRS scheme to collect tax on unoccupied properties from either the landlord or the new tenant who is yet to occupy the property. Additionally, as the BRS scheme is included with the current business rates notice in London (National Non-Domestic Rates (NNDR)), the cost of administering the tax is smaller than a completely new tax. As the BRS scheme has a lower cost of administration and raises a consistent revenue stream it is also efficacious.

One issue with the BRS scheme is that it collects tax on properties with a rateable value over £55,000 indiscriminately which may lead to some issues in equity. If a property in an outer borough has a rateable value over £55,000 yet sees no increase in property value from Crossrail, it may subsidise others while seeing no benefit. Another risk is that the BRS may cause some market distorting inefficiencies. For example, if a business has a rateable value over the hurdle yet is only performing marginally then the additional tax may cause them to shut down.

Crossrail is also partially funded by a developer contribution called the Mayoral Community Infrastructure Levy (CIL). Although it will raise £300 million, this is a substantially smaller amount than the BRS scheme and much smaller amount than the total funding needs of the project. The CIL is levied on all new developments in the Greater London area, and it charges a per square meter rate based on the proximity to the CBD. These rates are split into three zones that are shown in Figure 3.4. The CIL allows for exemptions if the new development is used for the provision of health services, charitable services and a number of other reasons.

The CIL may cause a number of distortions in the market by deterring marginal projects from happening, which leads to a potentially inefficient outcome. In addition to this, it must be noted that

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this type of tax may be difficult to rely on as the tax stream may not be consistent. This is because the timing of new developments is determined by the market.

The London Crossrail case suggests that in practice value capture can be an efficacious and relatively efficient way to fund infrastructure projects. As can be seen in the first years of the tax it has consistently raised the amounts that is was predicted to raise regardless of the economic climate with up to 98.4% of the predicted amount being collected in 2013/14. Additionally, due to the 10-25% rise in property values, the 2% tax increase on rateable value (which is less than property value) still leaves a large amount of benefit for the taxpayers.

In addition to London Crossrail there are numerous international examples of value capture. Listed in Table 3.1 are a number of recent examples and some issues involved with each case. Grand Paris Express is a large metro project with a combination of line upgrades and extensions which will cost €12 billion, and construction of new lines which will cost €22.65 billion. Work on the project started in 2015 and the project is expected to be completed on a rolling basis from 2022 to 2030. The Grand Paris Express will be funded with a combination of a location based payroll tax, and a new development tax on office space. Washington D.C. New York Avenue station began construction in 2002 and was completed in 2004. The project cost $84 million of which $25 million was provided by a Special Assessment District tax on office development. The line 7 extension was an extension of the New York subway system to Hudson Yard which began construction in 2009 and was completed by 2014. The subway extension cost $2.42 billion, the majority of which was funded by a TIF scheme collected by the City of New York.

<table>
<thead>
<tr>
<th>City</th>
<th>Pop Density</th>
<th>Instrument</th>
<th>% Funded</th>
<th>Issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>London</td>
<td>5,518/km²</td>
<td>Business Rate Supplement Community Infr. Levy</td>
<td>32%</td>
<td>CIL may distort market by preventing marginal developments</td>
</tr>
<tr>
<td>Paris</td>
<td>21,000/km²</td>
<td>Payroll Tax Development tax on office space</td>
<td>80%</td>
<td>Office development tax so high that it may forestall office development in some areas</td>
</tr>
<tr>
<td>Washington D.C.</td>
<td>4,251/km²</td>
<td>Special Assessment District (type of tax on close by commercial offices)</td>
<td>28%</td>
<td>Transit body directly funded by municipal and state governments making coordination difficult</td>
</tr>
<tr>
<td>Washington D.C.</td>
<td>4,251/km²</td>
<td>Developer Contributions</td>
<td>14%</td>
<td></td>
</tr>
<tr>
<td>New York City</td>
<td>10,831/km²</td>
<td>TIF Scheme (property tax) where base value was 0</td>
<td>88%</td>
<td>Residents of the area paid all tax toward infrastructure and none to general city needs</td>
</tr>
</tbody>
</table>

In the table above it is postulated that there is a positive relationship between the population density of a city and the percentage of a project that you can fund with value capture. This relationship is shown in Figure 3.5 below where population density was plotted against percent of project funded.

38 Ibid., 102.
39 Ibid., 110.
40 Metropolitan Transportation Authority, New 7 Line Extension to 11 Avenue, http://web.mta.info/nyct/service/new7LineExtension_to11Avenue.htm.
If this positive relationship were to hold for Brisbane,\textsuperscript{41} it could potentially fund approximately 15% of Cross River Rail using the population density of 140 people/km\textsuperscript{2}. This result makes no assumptions on the method used for value-capture. To compare how a tax scheme similar to the BRS scheme would work in Brisbane and whether it could raise the postulated 15%, a worked example was conducted using the net council rates collected per year in Brisbane.

\begin{table}[h]
\centering
\begin{tabular}{lcc}
\hline
 & Brisbane & Greater London & NYC (Brooklyn & Lower Manhattan) \\
\hline
\text{Population Density (population/km}^2) & 0 & 2,000 & 4,000 & 6,000 & 8,000 & 10,000 & 12,000 & 14,000 & 16,000 \\
\hline
\end{tabular}
\caption{Figure 3.5 Density and Percentage of Project Funded Relationship}
\end{table}

BRS applied to Brisbane

<table>
<thead>
<tr>
<th>Current Rates BCC p.a.</th>
<th>1,000,000,000</th>
<th>1,000,000,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of pop. Taxed</td>
<td>$\times 0.2$</td>
<td>$\times 1.0$</td>
</tr>
<tr>
<td>Increase of 2% on rates bill</td>
<td>$\times 0.02$</td>
<td>$\times 0.02$</td>
</tr>
<tr>
<td>30 year life</td>
<td>$\times 30$</td>
<td>$\times 30$</td>
</tr>
<tr>
<td>Total Tax Raised</td>
<td>120,000,000</td>
<td>600,000,000</td>
</tr>
<tr>
<td>% Cross River Rail Funded</td>
<td>Appr. 2%</td>
<td>Appr. 11%</td>
</tr>
</tbody>
</table>

Table 3.2 BRS Scheme Applied to Brisbane

Based on the $1 billion in rates collected by the Brisbane City Council\textsuperscript{42} a 2% tax increase was applied to the top 20% of rates collected in Brisbane for a 30-year life (see Table 3.2). This tax scheme would raise approximately $120 million over the life of the tax which represents approximately 2% of Brisbane Cross River Rail’s funding needs. Even when a 2% tax increase was raised on 100% of BCC rates over a 30-year life, the scheme only raised approximately 11% of Brisbane Cross River Rail’s funding needs. This suggests that if Brisbane aims to fund a significant amount of Cross River Rail’s capital cost, more sophisticated techniques will be required to do so. Evidence-based methods for conducting a more sophisticated approach will be discussed in the following section.


4.0. Methods for Evidence-based Value Capture Policy

As discussed in the Case Study, existing international approaches to value capture may not achieve similar outcomes in SEQ and to achieve future funding goals a more refined approach could be utilised. A more sophisticated approach to value capture would measure and target value uplift where it occurs. If governments have access to information about where value has been generated they are able to design policy such that it will be more effective and equitable.

Utilising more information in policy is part of a broader push towards ‘evidence-based policy-making’. While this is not a new concept, it has come into recent prominence as an important and uncontroversial measure in improving public policy. In the context of value capture policy, it would be highly advantageous to know: where value has accrued, how much uplift there has been, and which parties have seen the greatest benefit.

The challenge in using evidence-based policy-making for value capture is estimating the effect that infrastructure has had on land values. This can be done by undertaking an ‘impact evaluation’ which seeks to provide methods to monitor and evaluate a policy. Monitoring and evaluating provide sets of tools which can improve the quality, efficiency and effectiveness of reforms. Impact evaluations can be categorised into two broad types:

- **Ex post impact evaluation** which gathers evidence about the impacts of a project
- **Ex ante impact evaluation** forecasts likely impacts

The most frequently used in the context of assessing the impact of public mass transportation (PMT) has been hedonic price models (HPM) and, more recently the Difference-in-Differences (DID) estimator. The DID estimator is a type of ex post impact evaluation which measures changes in land values and isolates the effect infrastructure has had on them. On the other hand, the HPM approach can be used for both ex ante and ex post to either measure the impact infrastructure and other variables have had, or to forecast their future value if it were to be built. In addition to PMT impacts assessments for housing prices, both approaches have been used to estimate the effects of rail and highways on housing as well as commercial property, vacant land and apartment values, indicating that the approaches to value capture are robust enough for use on vastly different infrastructure projects. This section will also discuss Taxation Increment Financing (TIF), which can be seen as an ex post value capture mechanism. However, in TIF, all value uplift is attributed to the infrastructure and therefore is not an impact evaluation.

An illustration of how evidence-based policy-making may have improved funding infrastructure on the Gold Coast is shown in Box 4.1, utilising a recent University of Queensland impact evaluation conducted by Cameron Murray. The impact evaluation used a DID approach, which is detailed in Section 4.3.

<table>
<thead>
<tr>
<th>Box 4.1 Land uplift from the Gold Coast Light Rail (GCLR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• It has been estimated that $300 million was generated in land uplift to landowners within 400m of a GCLR station since the inception of the project, this represented a 7.1% increase in the land values.</td>
</tr>
<tr>
<td>• The Gold Coast City Council (GCCC) during this time had increased their City Transport Improvement Charge (CTIC), levied on all properties within the GCCC area, by $17.50 per property to fund GCLR, bringing the total CTIC to $111p.a. This increase resulted in $2.2 million p.a. of revenue.</td>
</tr>
<tr>
<td>• From a total project cost of $1.3 billion the CTIC increase has recovered approximately 0.86% of project costs out of a possible 23% from land uplift within 400m of GCLR stations, if all the uplift was captured.</td>
</tr>
<tr>
<td>• Substantial value uplift was also measured from 400-2000m of a GCLR station.</td>
</tr>
<tr>
<td>• It is possible that by using evidence-based value capture, a greater proportion of the GCLR project could have been funded from landowners who had directly benefited from the project.</td>
</tr>
</tbody>
</table>

### 4.1. Taxation Increment Financing (TIF)

Taxation Increment Financing (TIF) is a value capture mechanism which captures value through rises in land/property values. The TIF mechanism is illustrated in Box 4.1: a TIF district is announced, the level of land value of the district is frozen over a fixed period, and additional increases in land value in this timeframe are attributed to the infrastructure and hypothecated towards repayment of the debt. TIF allows governments to issue bonds against this future revenue stream. The funding source in TIF is the underlying taxation it is applied to; most commonly property taxes in the USA, however in Australia it is primarily discussed in the context of land taxes and, to a lesser extent, stamp duty. 

![Figure 4.1 Tax Increment Financing](image)

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51 Ibid.
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TIF was developed in the 1950s and is frequently used for urban renewal, however occasionally for financing new infrastructure. There is widespread use in the United States, with 155 TIF zones in Chicago in 2007, as seen in Figure 4.2. Briffault (2010)\(^{53}\) attributes the wide proliferation of TIF to it being, like the American local government, highly decentralised. However, TIFs use has slowed and several academic reviews have called into question their effectiveness.\(^{54}\) TIF zones over-attributing the impact infrastructure has had on property values as they cannot address the ‘but for’ question. That is, what the value of the zone would have been but for the infrastructure and TIF implementation (econometric techniques as described in following sections detail approaches to addressing this issue). Furthermore, if the infrastructure fails to raise property values, the municipality will still be responsible for repayment of the debt. For example, in Chicago, TIF zones have overall failed to produce the promises of increased employment, business, or real estate activity. As a result, this has placed fiscal strain on the City of Chicago’s general fund.\(^{55}\) Therefore, TIF requires a higher degree of risk-taking on the part of the public sector.\(^{56}\)

![Figure 4.2 TIF in Chicago\(^{57}\)](image_url)

Currently, there are some misconceptions surrounding TIF. Common misconceptions are that, “[TIF] is being used increasingly in other developed infrastructure markets as a mechanism to diversify funding sources”\(^{58}\) and “TIF enables governments to collect additional revenue from increases in values of properties adjacent to new infrastructure projects and use those ‘incremental’ taxes to finance those projects that have resulted in the property appreciation.”\(^{59}\) However, TIF will not increase/diversify funding sources and will not add additional revenue for governments. Only introducing/increasing tax


\(^{57}\) Cook County Clerk Map Dept, Tax Increment Financing Districts – City of Chicago Tax Year 2015 (2016)


rates can increase revenue, as TIF simply allocates a portion of revenue to repayment of the debt. However, new and increased taxes are generally not included in TIF and it has been called ‘tax allocation financing’ which reflects that it is more related to hypothecation.\textsuperscript{60}

Australian governments have had a general aversion to tax revenue hypothecation.\textsuperscript{61} Hypothecation of petrol and diesel excises was discontinued in 1959, partly because hypothecation was deemed to be unsound from a public finance policy perspective.\textsuperscript{62} This is due to the potential inefficiencies hypothecation can create in allocating funding for other government services. Additionally, it may reduce incentives to pursue efficient pricing policies for public transport fares and road use charges.\textsuperscript{63} TIF could be most applicable in scenarios where an econometric technique, as described in Sections 4.2, is not possible due to data limitations or other issues. (A discussion of endogeneity in econometric models can be seen in Box 4.3).

### 4.2. Hedonic Price Models (HPM) Approach

In general, more sophisticated studies on value uplift have relied on hedonic pricing models and a smaller subset of hedonic price models have incorporated spatial variation and spatial correlation between variables, which has provided models with significantly stronger predictive power. HPM is a multiple regression which examines the impacts of a number of attributes on land value/property price.\textsuperscript{64} Cervero and Duncan (2001)\textsuperscript{65} state that HPM is the best method available to identify effects on house prices associated with factors such as proximity to transportation facilities. This is from Gauss Markov theorem which states an OLS (such as a HPM) will be the best linear unbiased estimator, if correctly specified. The structure of HPM can be seen in Box 4.2.

<table>
<thead>
<tr>
<th>Box 4.2 Hedonic Pricing Models</th>
</tr>
</thead>
<tbody>
<tr>
<td>The structure of a hedonic pricing model is generally of the following structure:</td>
</tr>
<tr>
<td>[ y_{it} = \beta_0 + D_{it} \delta + X_{it} \beta + \epsilon_{it} ]</td>
</tr>
<tr>
<td>- ( D ) represents time fixed effects</td>
</tr>
<tr>
<td>- ( X ) includes the explanatory variables which include descriptors such as age of a property, number of bedrooms, distance from a train station etc.</td>
</tr>
<tr>
<td>- ( \beta ) is the hedonic price of the separate characteristics</td>
</tr>
<tr>
<td>- ( \delta ) is a vector which can be used to build a general price index</td>
</tr>
</tbody>
</table>

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According to Rambaldi and Rao (2011), commonly used hedonic models fail to account for changing consumer preferences over the characteristics being tested and do not typically take into account the role of locational characteristics. For example, the value of an observation is influenced by the value of the neighbouring observations (i.e. land/property) and in turn it influences surrounding observations, this phenomenon is known as spatial autocorrelation. Rambaldi and Rao (2011) propose the use of time-varying hedonic models with spatial autocorrelation to impute a house price index, which can be used to predict and understand causes and variations in housing prices. To obtain a more accurate estimator, these models allow for a spatial autoregressive specification of the dependant variable. The method to construct the spatial autocorrelation weights matrix has been detailed extensively in literature. It entails defining relationships between the observations in the study. For example, if there are n observations, a weights matrix could be the inverse distance squared between all observations, creating an $n \times n$ matrix.

Once a model has been developed, it can be used to form a prediction on the expected change in value of property/land values as a result of an infrastructure project. This may not be realised immediately, and further research is required into the rate of value accumulation. This represents one weakness of the HPM, relative to the DID estimator which can estimate the timing of the uplift.

The predicted value can be used as the basis for the capture amount (i.e. a portion of the predicted rise in value taxed over 5 years). An illustration of HPM estimations of changes in future value of land as a result of infrastructure can be seen by the black line in Figure 4.3, contrasted against theoretical actual changes in land values due to infrastructure shown in red:

Hedonic models can have strong predictive power, which means they are very useful for scenarios where it is important to predict the rise in value prior to the implementation of the infrastructure project. For example, if an estimate of the cost recuperated is required for the financing of the infrastructure or the government wishes to advise the residents of the levels of capture prior to its construction. While HPM will be the best estimator when correctly specified, they are more

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susceptible\(^6\) to endogeneity problems, notably, omitted variable bias. Endogeneity problems of econometric models are discussed in Box 4.3.

### 4.3. Difference-in-Differences (DID) approach

Due to the difficulties created by omitted variable bias in hedonic price models, there has been a recent emphasis placed on development of a Difference-in-Differences (DID) estimator for the effect of public transport infrastructure on house prices.\(^7\) The DID approach controls for the possible omission of variables correlated with the infrastructure descriptors. The DID estimator aims to measure the effect of a change on the dependent variable (land value) by comparing the difference in the level of this variable before and after a given critical date, between treatment group(s) and control group(s). Within the context of value capture, the treatment group is an area which has seen a larger benefits due to infrastructure relative to other areas. This difference between the trend of land values of the city and the measured outcome in the treatment group(s) is the impact effect of the infrastructure project, as can be seen in Figure 4.4.

![Figure 4.4 DID Method\(^7\)](image)

Similarly to HPMs, adding spatial autocorrelation effects to the DID can also improve the accuracy of an estimator, by eliminated bias which can occur when autocorrelation between observations is not treated for. This is done by creating a weights matrix as in the hedonic price model case.\(^8\)

The measured value form the basis for the capture amount (i.e. a portion of the measured rise in value from the period observed, to be taxed over 5 years). An illustration of DID measurements of changes in value of land as a result of infrastructure at discrete points in time is shown in Figure 4.5, contrasted against theoretical actual changes in land values due to infrastructure shown in red:

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\(^7\) Ibid.


DID estimators can provide an accurate measurement of land value changes attributable to infrastructure. While DID is preferred over Hedonic Price Models in being able to measure when value uplift has accrued, they cannot be used to forecast. DID is a robust method which may be useful to implement in some cases where endogeneity limits HPM use. However, all econometric methods may suffer from endogeneity, see Box 4.3 for discussion.

**Box 4.3 Endogeneity in Econometric Models**

Common causes of endogeneity in econometric models for property/land values:

- **Omitted Variable Bias (OVB)** is a significant cause of endogeneity in hedonic price models. If there is insufficient data on a variable, or an omission of a variable, which is a significant factor in determining property/land, then the estimator will be biased. For example, if there is insufficient data on number of bathrooms and that variable was significant in the final value, then there will be OVB.

- **Autocorrelation errors** are common causes of endogeneity in property/land price models. In real estate there is a strong correlation of property/land prices in close proximity to one another.\(^{73}\)

- Estimators such as the Difference-in-Differences, may also suffer from endogeneity. This primarily occurs if the treatment is endogenous. For example, if infrastructure is built because it is an area which is experiencing value uplift and not reversed.

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5.0. **Options for Value Capture**

Throughout history, governments have implemented varying forms of value capture strategies and policies to help recover the cost of public infrastructure development. The Victorian Government used value capture as early as 1926, when they applied the ‘Railway Betterment Rate’, an area based charge to landowners within one mile from the train-line after it was extended from Darling to Glen Waverley.\(^{74}\) While the general concept of using the unearned economic rent generated by a project to contribute to its funding is the same, using modern measurement techniques and applying the concepts of value generation, contemporary value capture schemes can be implemented in a much more effective way.

Understanding and measuring value uplift gives policy makers the ability to implement value capture mechanisms that directly target unearned economic rent. Applying a tax like the ‘Railway Betterment Tax’, without this information, risks creating an inefficiency by over or under charging landowners.

Although measurements of value uplift can be used to implement a more considered capture strategy, there are inaccuracies in any model and limits to the scope of a study. This requires policy makers to consider the efficacy of strategies, case by case. In the following section some options for value capture policy are evaluated in the context of South-East Queensland.

5.1. **Ex-Ante vs. Ex-Post Methods**

Value capture strategies can be separated into two types, ex-ante and ex-post. Ex-ante taxation methods collect the amount upon the implementation of the tax while ex-post taxation methods collect the value over a specified lifetime.\(^{75}\)

Ex-ante value capture methods aim to capture value uplift that is a result of the market anticipating the future benefit that a project will provide. The two mechanisms that are analysed further in Section 5.2, land auctions and beneficiary contributions, both aim to collect revenue during the initial phases of the project. This means that revenue can contribute to the funding of the initial capital costs.

Another advantage of ex-ante strategies is that they are relatively easy to implement compared to an ex-post land taxation method. Unlike ex-post methods, ex-ante methods generally do not require the development of additional legislation, and because administration costs of an ex-ante methods are relatively smaller than those of an ex-post method. For example, a land auction or major beneficiary contribution process may only result in dealing with a small number of private entities over the course of a few years. However, a land taxation value capture scheme may deal with thousands of individual landowners for a much longer timeframe.

Ex-post value capture methods are applied for a specified life and capture the value uplift retroactively. To use these ex-post methods, you need to separate out the effects that are not attributed to the infrastructure such as general price growth or other unrelated policy changes. If measurement is done with precision ex-post methods can lead to more equitable outcomes.

\(^{74}\) Prosper Australia, “Value Capture – a historical perspective,”

\(^{75}\) Marleen Brans and John Turnpenny, “The context and use of ex ante evaluation within governments,” (2016).
5.2. Analysis of Capture Methods

There are numerous options available for value capture. This report has not examined use of stamp duty and developer contributions due to their identification in the Henry Tax Review as being distortionary/inefficient. The capital gains tax (CGT) has also not been examined as the exemptions and discounts which apply to the tax would limit its efficacy. Lastly, betterment taxes were not analysed. While the Henry Tax Review states that they are an attractive taxation tool, betterment taxes have seen a long history of failure in implementation, potentially due to reluctance of landowners to sell land for development and become liable for the tax. As a result, this section will focus on three value capture options: negotiated beneficiary contributions, land auctions, and land taxes. These options will be evaluated for their efficacy and applicability in South-East Queensland.

5.3. Negotiated Beneficiary Contributions

Negotiated beneficiary contributions refer to the payments or contributions from private entities that will see direct benefit from an infrastructure project. These private entities include large shopping centres, airports, casinos, theme parks, and other large privately owned complexes. Payment by these beneficiaries can be negotiated on the increased patronage or turnover that the transport infrastructure adds through accessibility. By dealing with single entities, this method can be relatively simple to implement since it does not require negotiations amongst multiple parties. However, there are issues that can arise regarding the negotiation of payment. If the private party is convinced that a project will go ahead regardless of their payments, it is unlikely that they will negotiate a fair price.

5.4. Land Auctions

Government can capture value uplift through the sale or lease of publicly owned land that is within the vicinity of new transport infrastructure projects. Most large projects either use land resumption schemes or utilise state owned land for development. By implementing a strategy to sell the development rights of unused land, or specifically integrating development options into the project (see Box 5.1), the uplift can be captured by allowing the market value the land through an auction. A privately negotiated contract between a seller and single buyer may reach the same outcome as an auction would, however, this is not guaranteed. In contrast, by utilising competition between bidders, an auctions final selling price should be reflective of the true market value. In order for land auctions to be effective, they must be well designed (see Box 5.2).

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77 Nigel Stapledon (2016) Value Capture and Transport Infrastructure – Public Policy Issues- Presentation for the 2016 UNSW Real Estate Symposium
Box 5.1 Development Opportunities for Land Auction

The following development options can be integrated into the project design in order to maximise value captured by an auction.

**Rezoning of Land**

Value uplift of a transport infrastructure project is strongly correlated with the density of the surrounding area.\(^{81}\) If current zoning restricts developers to low or medium density land use, rezoning may increase value uplift in the area.\(^{82}\) Rezoning may not be suitable in scenarios where it does not fit into a broader city plan, or if demand for high density residential is low.

**Transit Oriented Development (TOD)**

Transit Oriented Development refers to the development of mixed-use community precinct along public transport nodes. By integrating an infrastructure project’s design with plans for high-density residential or commercial precincts, opportunity for value capture can be created through auctioning land and air rights at the TODs.

The Milton Residences, completed in 2015, is the first TOD under the Queensland Governments South-East Queensland Regional Plan (SEQRP) adjoining the Milton train station in Brisbane. While this development was not used as a value capture method, the same design principle in conjunction with auctions for development rights, could be applied to future projects.\(^{83}\)

Box 5.2 Land Auction Design

An efficient auction uses competition between bidders which will result in the sale of the asset at its true market value. In order for this to occur, the auction must be undertaken appropriately. The analysis that follows refers to Klemperer’s suggestions for auction design.

A reserve price should be set to cover the risk of inadequate competition at the auction. This price should be set at the minimum amount the auctioneer is willing to accept, and should be optimised so that they will be indifferent between selling in this period or the next. This gives the seller security that even if the reserve price is not met, they will not suffer a loss by holding onto the land.

Bidders should be made aware that the land on auction will be receiving new transport infrastructure, and that there will be opportunities to further develop the area. Additionally, during the auction, prices should be publicly and transparently determined by open competition.

Auctions should be designed so as not to deter bidders. Given an appropriate reserve price, an auction with too few bidders will still be efficient, however, will likely result in a lower sell price than if more bidders participated. Bidders may not enter the auction if the cost of entry is too high, for example, if the bidders are required to submit very detailed development programs.

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\(^{82}\) Ibid.

5.5. Land Taxes

As land cannot be relocated or reduced in supply, value uplift translated to land prices can be taxed without creating market distortions.\(^84\) Because of this, land is a suitable medium to apply an ex-post capture tax to. The Henry Tax Review states that land tax is one of the most efficient means of raising revenue and alterations to the existing structure is possible with little efficiency costs.\(^85\)

One of the main benefits of implementing a value capture scheme using land taxation is the ability to target the unearned economic rent received by a large group of individual landowners. A state land tax is currently used in Queensland, however, exemptions apply for the majority of residential properties.\(^86\) This reduces the efficiency of the tax because the supply of taxable land is no longer fixed given that the landowners can change the purpose of the land to receive exemptions.\(^87\) To achieve a more efficient state land tax would mean significant restructuring of the current system.\(^88\) Local government rates are also a form of land tax and, because local government land rates are applied to all properties, a value capture scheme can reduce legislative and administration costs by being combined with current rates notices.

Increases in land value caused by uplift will be partially captured through existing land rates, however this will only be a very small proportion. In the Brisbane City Council (BCC), these rates range from 0.3103\% of the total unimproved value of the land for Category 1 Principal Residential properties which account for over 65\% of the total sites in the BCC,\(^89\) to 1.80\% for some inner city commercial properties.\(^90\)

Under current land rates, landowners retain the majority of windfall gains caused by infrastructure projects. By applying special rates or charges to these landowners, a larger proportion of the unearned economic rent can be captured.

5.6. Policy Options for Council Rates

Local councils in Queensland apply a ‘special rate or charge’ levied on specific land which receives benefit from the provision of a service, facility or activity.\(^91\) South-East Queensland Councils already use these charges to fund infrastructure, thereby conducting value capture. For example the Gold Coast City Council ‘City Transport Improvement Charge’, which is levied on all rateable land.\(^92\) The levy could be applied as a lump sum ‘charge’ or as a ‘special rate’ and the optimal choice in the design of the levy would depend on the individual circumstances within which it is being applied and the information on where and to whom value uplift occurs.

\(^{85}\) Ibid., 48.
\(^{91}\) Department of Infrastructure, Local Government and Planning, “Rates and charges,” (2016).
Implementing Value Capture for Transport Infrastructure

It is possible to tailor the levy to maximise efficacy and equitability. The lump sum charge option can vary to landowners depending on their distance from the access point. This utilises the concept that value accrues as a function of accessibility to the infrastructure point, as described in Section 2.0. The benefit of varying the charge based on the access point is that it more directly targets value uplift. By defining zones around this point, an annual charge would be equal to a portion of the total uplift, divided by the number of sites in the zone. Another consideration is that value will accrue at a different rate for residential properties and commercial properties. This can be accounted for by separately measuring value accrual to different land zone uses, or by applying a multiplier to the charge for commercial land.

The second option in using local government land rates for value capture, is a special rate which would apply to the value uplift. The special rate is a flat tax and would therefore capture a proportional amount of value uplift. For example, if there is a land uplift of 10% to landowners, this 10% would mean larger absolute increase in value for higher value land. The special rate (i.e. 5% of value uplift) would also capture a higher absolute amount from higher value land. Therefore, it is not necessary to define segregated zones or to estimate a commercial property multiplier, as may be the case if using lump sum charges. Box 5.3 illustrates an example of how the special rate would be reflected in an individual rates notice under a special rate capture method, and contrasts it against the current rates arrangement.

**Box 5.3 Example of Value Capture Flat Tax**

Iris owns a commercial property (Group A) in Brisbane with an unimproved land value of $300,000. The current general rate Iris pays is 0.8922 cents in the dollar or $2676.60 p.a. Three years later Iris’ land has appreciated to $350,000; under the current rates arrangement, Iris would pay $3,122.70 p.a.

Suppose Brisbane City Council had imposed a flat tax value capture mechanism on 30% of Iris’ uplift as a result of a rail project incrementally over 20 years. A difference-in-difference method has been used to estimate that approximately $40,000 of the $50,000 on Iris’ land appreciation was directly due to the rail project. Iris will pay general rates (0.8922 cents on the dollar) on $310,000 and a flat tax rate on the value uplift (1.5\(^\circ\) cents on the dollar) on $40,000.

Iris’ rates notice under current arrangements:

<table>
<thead>
<tr>
<th>Summary of Charges</th>
<th>Rateable Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brisbane City Council Rates &amp; Charges</td>
<td>$350,000.00</td>
</tr>
</tbody>
</table>

Iris’ value capture rates notice under value capture flat rate:

<table>
<thead>
<tr>
<th>Summary of Charges</th>
<th>Rateable Value</th>
<th>Value Uplift</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brisbane City Council Rates &amp; Charges</td>
<td>$310,000.00</td>
<td>$40,000.00</td>
</tr>
</tbody>
</table>

| Value Capture Charge | 600 |

\(^\circ\) 30% over 20 years
5.7. **Worked Example: Cross River Rail Project**

There is significant interest in using value capture to fund the proposed Cross River Rail (CRR) in Brisbane. One of the potential funding options currently considered by the Queensland Government is an increase in residential rates on nearby properties. Utilising a combination of the land rate levies as described in Section 4.2.2, the following section illustrates how value capture could be used in Brisbane to contribute to the funding of the project.

This worked example assessed if there was a special rate applied to value catchment areas shown in Figure 5.1 and a lump sum charge to remainder of the network. As the CRR is projected to have significant positive effects on the entire network, these benefits could be captured with the wider lump sum charge.

![Figure 5.1 Potential Value Catchment Areas](image)

The characteristics of the catchment zone are shown in Table 5.1. Projecting a 3-7% value uplift range on land within the highlighted areas was chosen for this example. Econometric modelling was not performed, however the range of uplift was chosen based on the Australian Department of Infrastructure and Regional Development land value uplift report, where studies showed an average of 6.9% land value uplift due to heavy rail infrastructure.

<table>
<thead>
<tr>
<th>Table 5.1 Catchment Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Sites</td>
</tr>
<tr>
<td>Total Land Value</td>
</tr>
<tr>
<td>Percentage Commercial Land</td>
</tr>
<tr>
<td>Annual Rates Paid</td>
</tr>
</tbody>
</table>

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93 Cameron Atfield, “PM ties Cross River Rail funds to Brisbane Metro project,” (2016).
94 Ng et al., “Focus: Bill to Establish Cross River Rail Delivery Authority,” (2016).
Implementing Value Capture for Transport Infrastructure

The projected range of value uplift would produce from $434.4m-$1,013.6m in total value uplift. If 2% of this amount was captured annually (60% of the total value uplift over 30 years, leaving 40% of uplift to landowners), the targeted special rate would raise from $8.7m-$20.3m p.a. Combining this with a $50 lump sum charge on the all rateable property within the Brisbane City Council, due to the wider benefits the project produces, would raise $24.8m. Combined the two levies would raise $33.5m-$45.1m p.a. which would represent 14.5%-19.5% of the project cost over 30 years. Value capture could funding a significant portion of the Cross River Rail project in a more targeted way, while still leaving significant uplift to landowners.

<table>
<thead>
<tr>
<th>Flat Tax on Value Generation Zones</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Total Uplift (from 3-7% value uplift)</td>
<td>$434.4m-$1,013.6m</td>
</tr>
<tr>
<td>Flat Tax Rate on Individual Uplift</td>
<td>2%</td>
</tr>
<tr>
<td>Average Annual Charge</td>
<td>$280-$654</td>
</tr>
<tr>
<td>Annual Tax Revenue</td>
<td>$8.7m-$20.3m</td>
</tr>
</tbody>
</table>

| Lump Sum Charge on BCC Network                     |                |
| Annual Lump Sum Charge                             | $50            |
| Annual Tax Revenue                                 | $24.8m         |

| Total Project Cost Recovery                         |                |
| Total Project Cost                                 | $5.4b          |
| Annual Value Capture Revenue                       | $33.5m-$45.1m  |
| Timeframe                                          | 30 years       |
| Percentage Recovery                                | 14.5%-19.5%    |
6.0. Conclusions

Whilst value capture has recently emerged as a popular funding mechanism for transport infrastructure, it is not a new concept, and it is certainly not the “magic bullet” some claim it to be. In fact, Government already captures value that is created by infrastructure through their current taxation schemes. Despite these existing methods, there has been significant pressure to diversify the current methods of funding infrastructure, as well as strengthen the beneficiary-pays model, in order to address the current identified funding gap.

Prior to implementing value capture, it is crucial to place an emphasis on understanding how value is generated, and to recognise the concepts at play in land value uplift. The primary concept is that value uplift on land due to the transport infrastructure will be equal to the benefit of added accessibility the infrastructure provides. This concept allows for a distributional analysis of value uplift across all the beneficiaries of infrastructure, which in turn allows the policy maker to deliver a targeted value capture strategy.

A popular international example of value capture is the London Crossrail project. This method collected a small amount from a large group, and funded a large percentage of the Crossrail project. When this concept was applied to Brisbane in the context of the Cross River Rail project, it was found that it would only fund approximately 2% of the project. This suggests that more sophisticated methods than London’s broad-brush technique will be required to successfully implement value capture in South-East Queensland.

Utilising more information in policy is part of a broader push towards ‘evidence-based policy-making’. The challenge in using evidence-based policy for value capture is estimating the effect that infrastructure has had on land values. This can be done by undertaking an ‘impact evaluation’ which seeks to provide methods to monitor and evaluate a policy. The two methods used for impact evaluation are the HPM and DID estimator which both have merits and weaknesses that dictate how they can be used. When these methods are not possible to implement, TIF could be used as an alternative.

A range of policies were then compared to see how a government could potentially capture estimated uplift. A worked example for how value capture could work in South-East Queensland was applied to the proposed Brisbane Cross River Rail project. A combination of a broad- based lump sum charge and a targeted special flat rate tax implemented over a 30-year period could raise 15-20% of the projects cost, assuming a 3-7% land value uplift in affected areas. This shows that a sophisticated approach to value capture in South-East Queensland could fund a significant amount of Cross River Rail while leaving substantial benefits to landowners.
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