TRANSIT VALUE CAPTURE FINANCE – A GLOBAL REVIEW TOWARDS MEASURING MONETARY EFFICIENCY

by

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TRANSIT VALUE CAPTURE FINANCE

A Global Review towards Measuring Monetary Efficiency

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Acronyms

AMRON - Analysis and Monitoring of Real Estate Market Transactions

BAD – Benefits Assessment District

BART – Bay Area Rapid Transit

BID – Business Improvement District

BRS – Business Rate Supplements

BRT – Bus Rapid Transit

CBD – Central Business District

CSF – Critical Success Factor

DBLVC – Development Based Land Value Capture

FSR – Floor Space Ratio

GLA – Greater London Authority

HDB – Singapore Housing Development Board

HOT – Higher Order Transit

IRR – Internal Rate of Return

LAD – Local Improvement District

LRT – Light Rail Transit

LVC – Land Value Capture

LVT – Land Value Tax

MAE – Multiple Accounts Evaluation

MRT – Mass Rapid Transit

MTR - Hong Kong Mass Transit Railway Corporation

NMG – Nanchang Municipal Government

NRTG – Nanchang Railway Transit Group

PPP – Public Private Partnership

R+P – Rail Plus Property

ROW – Right of Way

RRT – Rail Rapid Transit

RRT – Rapid Rail Transit

SAD – Special Assessment District

SAR – Special Administrative Region

SPV/SPE – Special Purpose Vehicles/Entities

TBLVC – Taxation Based Land Value Capture

TDCC – Transit Development Cost Charge

TfL – Transport for London

TID – Transportation Improvement District

TIF – Tax Increment Financing

TOC – Transit Oriented Corridor

TOD – Transit Oriented Development

TLVCCRR – Transit Land Value Capture Cost Recovery Ratio

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Executive Summary

Land Value Capture (LVC) is an alternative method of transit finance that recovers land value gains (an unearned income) enjoyed by transit proximate properties, for transit project funding purposes. The application of transit value capture funding is predicated primarily on transit induced land value increases (capitalization) enjoyed by private land owners, and the increasing funding responsibilities of transit agencies globally. There are two approaches to land value capture (LVC); they include Development Based Land Value Capture (DBLVC) and Taxation Based Land Value Capture (TBLVC). The former leverages land assets and development rights in transit proximate areas in order to meet a transportation funding objective, whereas the latter leverages and applies taxation powers and instruments available to transit agencies and governments on transit benefitting properties. DBLVC instruments discussed in this report include: Direct Property Development, Joint Property Development, Land Sales, Land Lease Agreements, Land Readjustments, and Urban Redevelopment Schemes. Direct Property Development and Joint Property Development are highlighted in this report by conducting case studies on Nanchang, China and Hong Kong Mass Transit Railway (MTR) Corporation respectively. TBLVC instruments discussed in this report include: Tax increment financing, Special Assessments, Land Value Tax, Betterment Charges, Transportation Impact Fees, and Station Connection Fees. Betterment Charges are highlighted in this report by conducting a case study on London's Crossrail Business Rate Supplement (BRS). Using limited public financial data, the financial performance of the three highlighted LVC case studies – Nanchang Direct Property Development program, Hong Kong MTR Rail plus Property program, and London Crossrail BRS - are assessed using the Transit Land Value Capture Cost Recovery Ratio (TLVCCR) – a ratio comparing the implementation cost of LVC mechanisms to revenues generated.

In terms of distinct advantages:

- DBLVC through property development has a higher revenue potential
- DBLVC involves relatively low political risk
- DBLVC is based on partnership between agency and private land developers and owners in sharing land value gains through mutually beneficial land and development transactions as opposed to exactions

- TBLVC requires low financial cost of implementation (land acquisition not incurred)
- TBLVC involves low financial risk during implementation
- TBLVC can be applied multiple times over a long period of time to transit benefitting properties in order to generate significant revenues for transit project funding.

The critical success factors and supporting conditions required to successfully apply transit value capture finance in any context include: Feasibility, Equity, Efficiency, and Revenue Capacity.

Methodology

The methodology for this report was primarily based on secondary research. It involved the collection of quantitative and qualitative data from secondary sources including: books, government reports, journal articles, websites, working papers, research reports, and consulting reports. Independent data analysis and financial analysis were conducted on data collected from these sources.

In order to assess the case for transit induced land value capitalization and transit land value capture finance, the results of several research studies on transit capitalization were reviewed and summarized. Similarly, a qualitative review of literature was conducted to identify the critical success factors of transit land value capture. Three detailed case studies of transit land value capture were adopted from multiple secondary resources. A ratio for measuring the efficiency of transit land value capture was applied to the three highlighted global case studies.

1 Value Capture Finance for Transit Investments: Definition and Rationale

Land Value Capture (LVC) is defined as a method of public finance that recovers the land value increments on land[1] generated as a result of public sector investments and interventions (examples: transit service delivery, granting development rights), for local reinvestment in public goods that generate additional public and private benefits (Huxley, 2009; Smolka & Furtado, 2002). Transit Value Capture is thus defined as a finance mechanism whereby transit agencies capture some of the land value gains[2] induced by public transit investments but enjoyed by private landowners (Medda & Modelewska, 2009).

LVC is based on the principle that land values are not only determined by the intrinsic value of land and private investments in land improvements, but are also determined by external factors such as land use regulations, public investments in social services and infrastructure, population growth, and economic development (see table 1) (Suzuki et al., 2015).

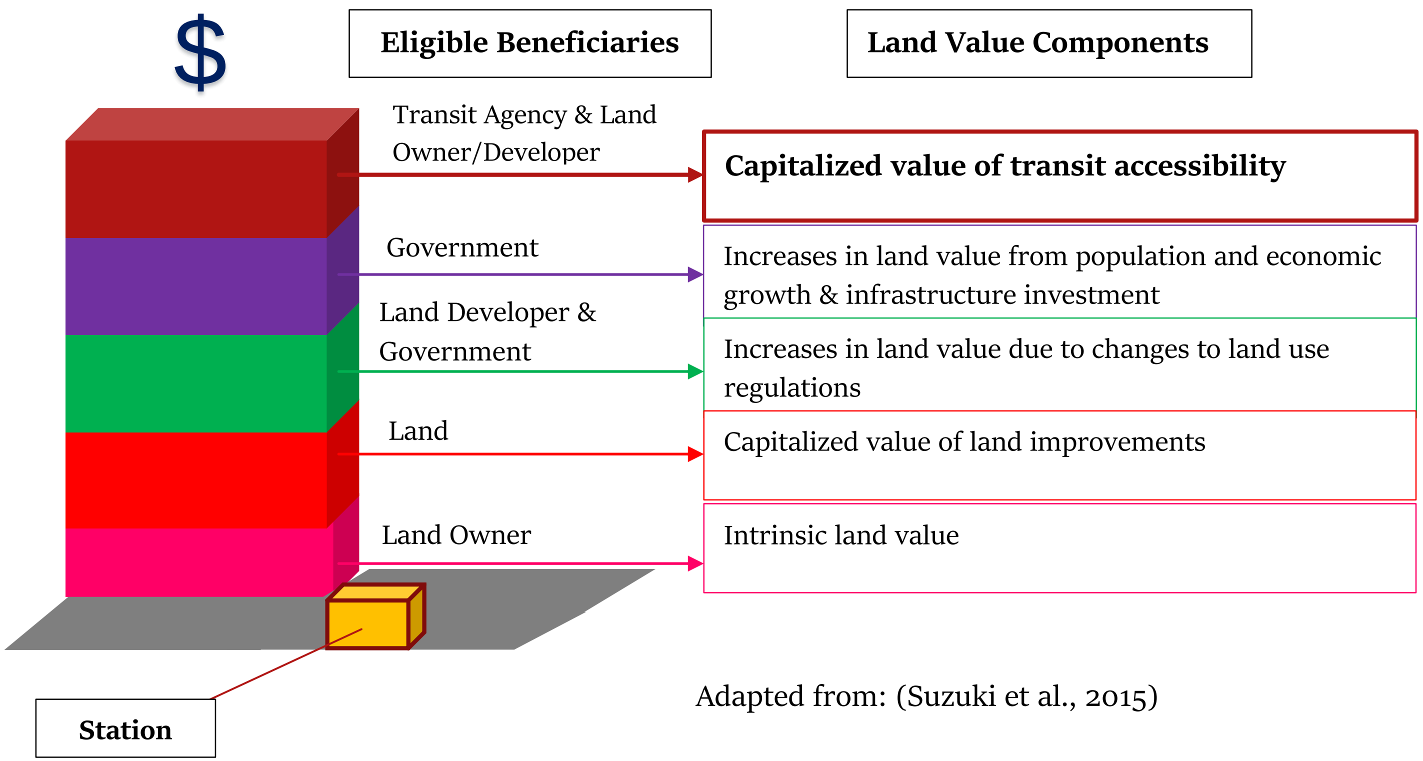
Table 1. *The Primary Determinants of Land Values.*

Land Value Determinant	Description
Land use regulation	Government provision of development rights or buildable space on land through upzoning
Public investments in social services and infrastructure	Social services and infrastructure include: schools, hospitals, transit, parks, etc.
Private investments on land improvements	Land owner investments in on-site construction and land improvements
Population growth and economic development	Increases in land value as a result of the growth in population – due to natural population growth, migration, and rapid urbanization – and increases in income levels.
Data Source: (Hong & Brubaker 2010)	

[1] Land and property are used interchangeably in this report

[2] Land value gains, increments, increases, premium, and uplift are used interchangeably in this report.

Public sector investments in transit infrastructure are often considered external drivers of land values because transit investments create access to employment and amenities for surrounding private properties, which in turn increases their value (Du & Mulley, 2006; Mathur & Smith, 2013; Medda, 2012; Rodríguez & Targa, 2004; Ryan, 1999). Increase in the values of surrounding properties is called **Transit Induced Land Value Capitalization** (Bowes & Ihlanfeldt, 2001; Fensham & Gleeson, 2003; Landis et al., 1995; Medda, 2012; Salon & Shewmake, 2011; Suzuki et al., 2015). This is an unearned economic value that accrues to private land and property owners (Du & Mulley, 2006; Hess & Almeida, 2007; Mathur & Smith, 2013; Pagliara & Papa, 2011; Rybeck, 2004; Smolka & Furtado, 2002; Smolka, 2013; Zhao, Iacono, Lari, & Levinson, 2012). Transit agencies and governments acting on behalf of the public are creators of the land value uplift by virtue of their investments in urban areas, and are entitled to a portion of the value gains to fund transit investments (see figure 1) (George Hazel Consultancy, 2013; Gihring, 2009; Levinson & Istrate, 2011; Medda & Modelewska, 2009).



Adapted from: (Suzuki et al., 2015)

Figure 1. *Components of land values and their eligible beneficiaries in urban regions*

In validating the utilization of transit land value capture for regional transit investments, the depletion of traditional transit funding sources (examples: farebox revenue, fuel tax, and property tax) is often highlighted (Ingram & Hong, 2011; Salon & Shewmake, 2011). The increase in transit demand, population growth, and the increasing diversity and complexity of regional transportation needs render traditional funding sources incapable of covering the full financial costs of transit investments (Graham & Van Dender, 2009; Medda & Modelewska, 2009; Salon & Shewmake, 2011; Zhao et al., 2012). For these reasons, proponents of land value capture argue that a portion of land value gains should be recovered to fund transit projects using value capture mechanisms available to governments and agencies (Gihring, 2009; Ingram & Hong, 2011; Smith & Gihring, 2006; Smolka, 2013; Zhao et al., 2012).

1.1. The Capitalized Values of Accessibility

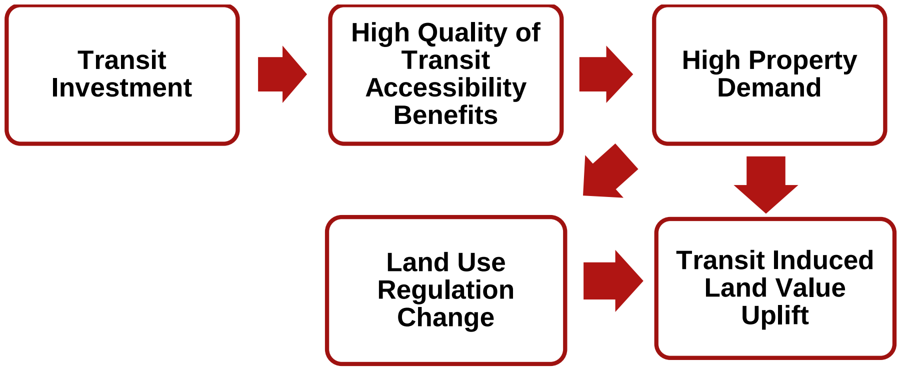
The capitalized land value of accessibility is defined as the component of the total financial value of land or property that is explained by the access to natural, social, and economic resources (Medda, 2012). The types of capitalized value of accessibility in land prices include access to urban externalities, access to social infrastructure, and access to development infrastructure (see table 2) (Fensham & Gleeson, 2003).

Table 2. *Types of Capitalized Land Value of Access*

Types of Capitalized Value of Access	Description
Access to urban externalities	Urban externalities include natural amenities and views (examples: waterfront, mountains, and woodlands); goods and services; and markets and suppliers.
Access to social infrastructure	Infrastructure and services provided by government using public funds. This includes infrastructure such as public transport, arterial roads, schools, and hospitals. Transit accessibility and its impacts on land values fall under this category.
Access to development infrastructure	Infrastructure that serve individual properties, and funded by user fees charged by municipalities. This includes infrastructure such as sewage disposal, drainage, local roads, and public parks
Data Source: (Fensham & Gleeson, 2003)	

Medda (2012) suggests that public transit investments increase the "*capitalized land value of access to social infrastructure*" of adjacent properties *because* individuals are willing to pay a price premium to enjoy the economic benefits of transit accessibility (Bowes & Ihlanfeldt, 2001). Transit infrastructure may as a result stimulate land use changes and development intensification around stations, to cater to high market demand for transit proximate properties (see figure 2) (Cervero & Murakami, 2009; Cervero & Kang, 2011; Ma, Ye, & Titheridge, 2013; Salon, Wu, & Shewmake, 2014). Accordingly, transit accessibility benefits and induced land use change are capitalized into the purchase price and rent of adjacent private properties (Börjesson et al., 2013; Cervero & Kang, 2011; Gihring, 2009; Landis et al., 2012; Pagliara & Papa, 2011; Smolka, 2013).

Figure 2. *The pathway of transit induced land value capitalization starting with transit investment*



However, in reality it could be argued that the capitalization impacts of transit investments on urban land markets have declined overtime due to the surge in automobile travel in cities, and advancements in telecommunications which have enabled individuals and firms to commute longer distances between the urban core and the outlying suburbs (Ingram & Hong, 2011).

1.2. Accessibility and Agglomeration Benefits of Transit Investments

Accessibility is an important benefit generated by public investments in transit projects (provision and improvements) (Bae, Jun, & Park, 2003; Bocarejo & Oviedo, 2012; Cervero & Kang, 2011; Du & Mulley, 2006; Levinson & Istrate, 2011; Medda, 2012). It is defined as the ability to reach valued destinations with economic resources and social opportunities such as employment, goods and services (retail), education, and recreation (community amenities) (Levinson & Istrate, 2011; Suzuki et al., 2015). Accessibility is measured as the distance from properties to transit stations and transit corridors that pedestrians encounter (Hess & Almeida, 2007). The economic benefits of transit accessibility are vast because transit allows individuals to gain access to valued destinations and economic opportunities at comparatively lower travel costs than private automobiles, thus keeping generalized household travel costs down (Cervero & Murakami, 2008; Gihring, 2009; Murat Celik & Yankaya, 2006; Ryan, 1999; Shah et al., 2013; Suzuki et al., 2015).

Similarly, transit investments are often viewed as having the potential to generate agglomeration benefits in urban regions (Cervero & Murakami, 2008; Kitchen & Lindsey, 2013; Smith & Gihring, 2006). An increase in accessibility and affordable mobility options decreases the interaction cost within the spatial economy and boosts the agglomeration of economic activity, thus enabling greater scale economies (Graham & Van Dender, 2009). Furthermore, compact forms of urban development supported by increased investments and access to mass transit options improves the proximity of businesses to skilled employees and consumers (agglomeration economies), thus increasing the overall level of productivity and commercial activity in urban areas (CPCS Transcom, 2011; Graham & Van Dender, 2009; Salon & Shewmake, 2011). Overall, transit investments create real economic benefits for individuals and businesses through accessibility and agglomeration economies (Bowes & Ihlanfeldt, 2001), which generate positive multiplier effects for urban and national economies (CPCS Transcom, 2011). Other important benefits generated by transit investments not discussed in detail in this report include: congestion relief, emissions reduction, and positive public health outcomes. (George Hazel Consultancy, 2013; Gihring, 2009; Graham & Van Dender, 2009; Medda & Modelewska, 2009; Ryan, 1999; Salon et al., 2014; Suzuki et al., 2015).

1.3. The Relationship between Transit Investments on Property Values

Multiple studies have shown that property values and rent generally rise with proximity to transit lines and stations, reflecting the more accessible nature of such properties (Bae et al., 2003; Bowes & Ihlanfeldt, 2001; Cervero & Kang, 2011; Du & Mulley, 2006; Heres, Jack, & Salon, 2013; Landis et al., 1995; Salon et al., 2014). However, studies have provided a wide range of estimates for the land value impacts of transit investments. The results of several transit induced land value capitalization studies are summarized in table 3.

Table 3. *Transit induced land capitalization studies*

Author(s) & Year of Publication	Study Area	Type of Property	Dataset	Methodology	Results
(Cervero & Kang, 2011)	Seoul, Korea	Residential and Commercial	Parcel level data for the 2001 – 2007 period from the Seoul Assessor's Office	Hedonic Price Model	Land value uplift of up to 10 percent was recorded for residences located within 300 metres of Bus Rapid Transit (BRT) stops. Land value uplift of up to 25 percent was recorded for retail and other commercial uses located within 150 metres of BRT stops.
(Medda & Modelewska, 2009)	Warsaw, Poland	Residential	Property sales prices, property features, and property location for the period of 2006 – 2010 provided in the Analysis and Monitoring of Real Estate Market Transactions (AMRON) Database	Hedonic Price Model	In the Bielany district of Warsaw, the sale price of properties located within 1 kilometre of Line 2 metro station are 6.7 percent higher than the sale price of properties farther from stations in the same district. Similarly, in the Targowek district of Warsaw, where the planned extension of the Line 2 metro will traverse, the authors predict that properties located within 1 kilometre from planned stations will sell at prices that are 7.13 percent higher than the prices of properties located farther from planned stations in Targowek district.
(Ma et al., 2013)	Beijing, China	Residential	2011 real estate data on property sales and key property characteristics for the Beijing area	Hedonic Price Model	Properties located within 800 metres of rail transit stations areas recorded 4.8 percent increase in prices. The effects of rail transit proximity on properties outside the 800 metres rail transit station catchment were statistically insignificant. No statistical significance in transit proximity effects were recorded for properties located within a 400 metre catchments of BRT stations. Significant negative effects were recorded for properties located between 400 metres and 800 metres of BRT stations, which might be explained by factors that were not controlled for in the model.
(Dueker & Bianco, 1999)	Portland, Oregon (USA)	Residential	Property prices and sales data for the 1980 to 1990 period	Pre-and post-test analysis (1986 opening for revenue service of East Side MAX Light Rail)	Property values increase by $1,593 every 60 metres close to East Side LRT stations.

Author(s) & Year of Publication	Study Area	Type of Property	Dataset	Methodology	Results
(Hess & Almeida, 2007)	Buffalo, New York (USA)	Residential	2002 assessed property values and data on property/ neighborhood characteristics, and location amenities	Hedonic Price Model	Properties located within a 400 metre radius of LRT stations gained land value increases of $1300 - $3000 or 2 – 5 percent of Buffalo's median home value. Increases in proximity to transit stations by a foot increases the property values in the study area by $2.31 (using straight line distance) and $0.99 (using network distance).
(Bowes & Ihlanfeldt, 2001)	Atlanta, Georgia (USA)	Residential	Single family property sales data in the Atlanta region from 1990 to 1994	Hedonic Price Model	The price of properties within 400 metres of a rail station in Atlanta were 19 percent less than the price of properties located more than 4.8 kilometers from rail stations, reflecting the negative externalities (nuisance) associated with residing very close to transit stations. In contrast, properties located between 1.6 kilometres and 4.8 kilometres of rail stations recorded significantly higher values (between 11-45 percent) than those located farther away (2 percent).
(Schiff et al., 2012)	Vancouver, Canada	Residential	Property sales data for 2000 – 2012 time period (covering pre-Canada Line announcement, Canada Line confirmation, construction, and revenue service operation)	Repeat Sales Analysis and In-specification Regression	Properties located within 500 metres of Canada Line Rapid Transit stations recorded land value uplifts of 2.6 percent. Transit premiums were not recorded for properties located within 1km to 2km of Canada Line stations possibly due to: limitations of the repeat sales method; high automobile dependence; relatively high income levels; and low transit patronage in the study areas.
(Landis et al., 1995)	San Diego, California (USA)	Residential	1990 Property sales data for 4180 single family properties in the Alameda, Contra Costa, Sacramento, San Diego, San Mateo, and Santa Clara counties	Hedonic Price Model	Property price increase of $272 for every 100 metres near San Diego Trolley light rail stations.

Author(s) & Year of Publication	Study Area	Type of Property	Dataset	Methodology	Results
(Landis et al., 1995)	San Francisco, California (USA)	Residential	1990 Property sales data for 4180 single family properties in the Alameda, Contra Costa, Sacramento, San Diego, San Mateo, and Santa Clara counties	Hedonic Price Model	Single family property prices increased by 100 percent (from \$100 to \$200 per square metre) for every metre near San Francisco BART stations.
(Cervero & Murakami, 2009)	Hong Kong	Mixed Use Residential and Commercial	2005 housing sales transaction data and proprietary sales data for 300 properties	Hedonic Price Model	Residential and commercial (retail and office) properties located within 400 metres of rail transit stations had a price premium ranging from 4.7 percent to 15.7 percent
(Sue & Wong, 2010)	Singapore	Residential (high rise apartments) *Note: 80 percent of Singaporeans live in public residential apartments/flats	2001 – 2006 housing sales and housing features data from Singapore's Housing Development Board (HDB)	Hedonic Price Model and Regression Discontinuity Design	Residential apartments located within 300 metres of bus interchanges recorded price premiums between 4 – 9 percent. Residential apartments located within 500 metres and 750 metres of MRT station recorded price premiums of 17.3 percent and 17.2 percent respectively.
(Cervero & Duncan, 2002)	Santa Clara County, California	Commercial (Retail and Office)	1998-1999 Metroscan data on property transactions and property features for 1197 properties	Hedonic Price Model	Typical commercial properties located within 400 metres of LRT stations recorded land value uplift of roughly 23 percent; while commercial properties located in the Central Business District (CBD) within 400 metres of LRT stations recorded land value uplift of over 120 percent
(Jones Lang LaSalle, 2013)	Metro Vancouver, Canada	Commercial (Office)	Not Provided	Rapid Transit Office Index Tool	Office spaces situated within 500 metres of rapid transit stations across Metro Vancouver have price premiums of 10 to 30 percent compared to office spaces located outside the 500 metre station area catchment.
(Rodríguez & Targa, 2004)	Bogota, Colombia	Residential (Multi-Family)	2002 rent prices for properties within 1.5 km buffer areas of two main Transmilenio trunk lines	Hedonic Price Model	The rental price of a property increased by between 6.8 and 9.3 percent for every 5 minute of additional walking time to a BRT station

Author(s) & Year of Publication	Study Area	Type of Property	Dataset	Methodology	Results
(Rodríguez & Mojica, 2009)	Bogota, Colombia	Residential (Multi-Family)	Before and after BRT extension property sales data for 2001 – 2006 period in BRT intervention area and control area	Hedonic Price Model	The asking prices of residential properties were 13 to 14 percent higher in the BRT intervention area (within 500 metres of BRT stations) than in the control area.
(Rosiers, Thériault, Voisin, & Dubé, 2010)	Quebec City, Canada	Residential (Single Family)	1993 – 1997 single family house sales data (n = 11,291) as well as transit network quality data	Hedonic Price Model	Properties located between 100 to 400 metres of express bus stations recorded land value uplifts of roughly 1 percent.
(Wang, Potoglou, Orford, & Gong, 2015)	Cardiff, Wales (UK)	Residential	2000 – 2009 property prices and bus stop locations	Hedonic Price Model	Land value uplift of 0.22 percent in property sales price was recorded for every high end property located within 1500 metres of bus stops. In contrast, cheaper properties have recorded land value uplift of 0.11 percent in property sale price.
(Salon et al., 2014)	Guangzhou, China	Residential	2010 – 2011 residential housing listings (n=35,030)	Hedonic Price Model	Property value uplift of 29 percent and 34 percent were recorded for properties located within 500 metres of BRT stops and metro stations respectively; 26 percent and 22 percent uplift for properties located within 1 kilometres of BRT stops and metro stations respectively; 30 percent and 13 percent uplift for properties located within 3 kilometres of BRT stops and metro stations respectively.

1.3.1. Transit Investments and Land Speculation

Multiple studies have shown real estate markets and property values responding positively to transit investments prior to their completion, providing evidence of land speculation and economic rent seeking on the part of property buyers and developers (Bae et al., 2003; Cervero & Kang, 2011; Medda & Modelewska, 2009; Pagliara & Papa, 2011; Rodríguez & Targa, 2004).

In the pre-post analysis of the impacts of Seoul Subway Line 5 on residential property values, Bae et al. (2013) observed that upon announcement of the construction of Subway Line 5, the prices of residential units located less than 200 metres, 200-500 metres, 500-1000 metres, and 1 kilometre, of proposed stations increased by 3.6 percent, 67 percent, 63 percent, and 53.8 percent respectively (see figure 3). They observed similar price changes in surrounding residential units during line construction and after construction (revenue service operation), which is explained by high property demand in areas adjacent to Seoul Subway Line 5 stations (see figures 4, 5, and 6). These observations support the hypothesis that a relationship exists between transit proximity and the speculative demand for transit accessible properties before and after transit project completion.

Figure 3. *Impact of the Announcement of Seoul Subway Line 5 on Surrounding Residential Unit Prices. Data Extracted From (Bae et al., 2003)*

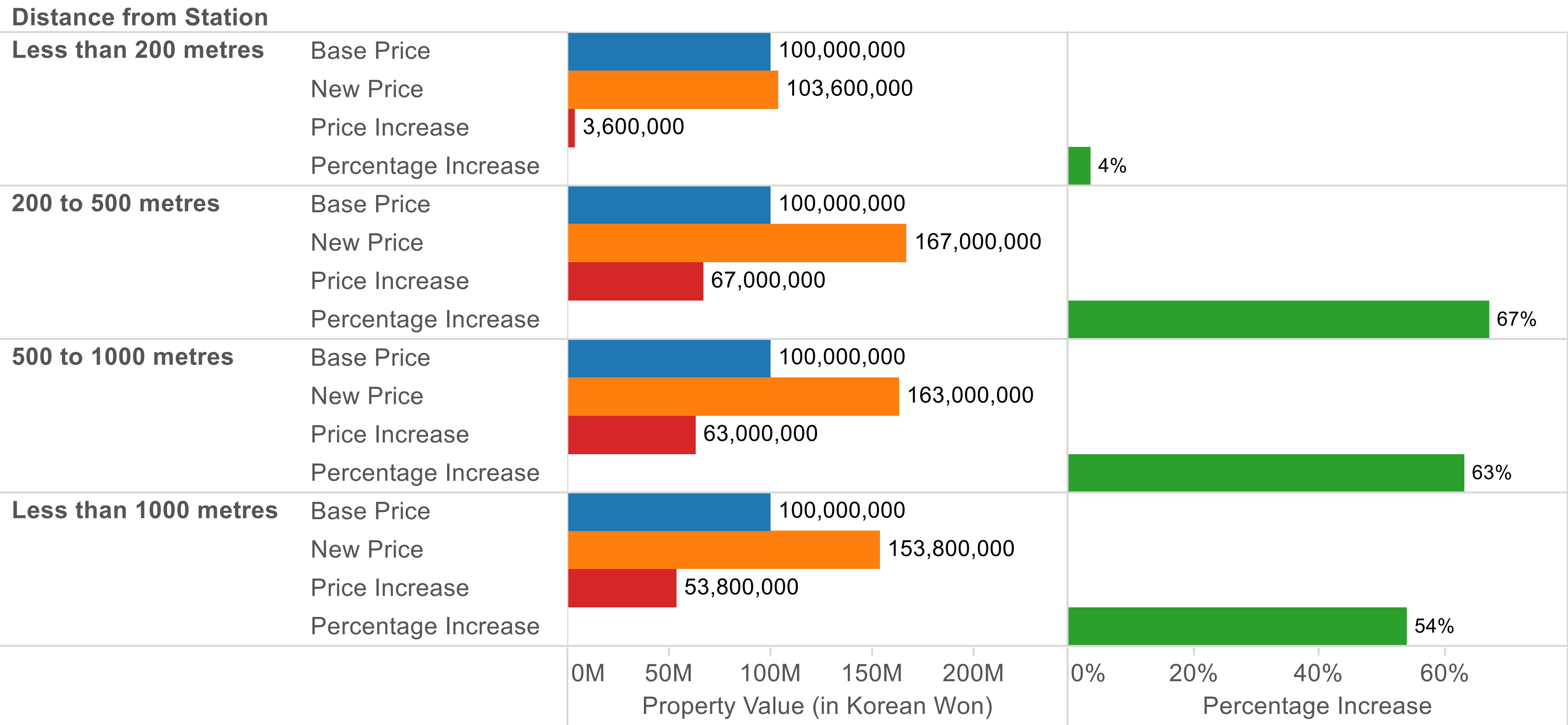


Figure 4. Impact of Seoul Subway Line 5 on Surrounding Residential Unit Prices during Line Construction. Data Extracted From (Bae et al., 2003)

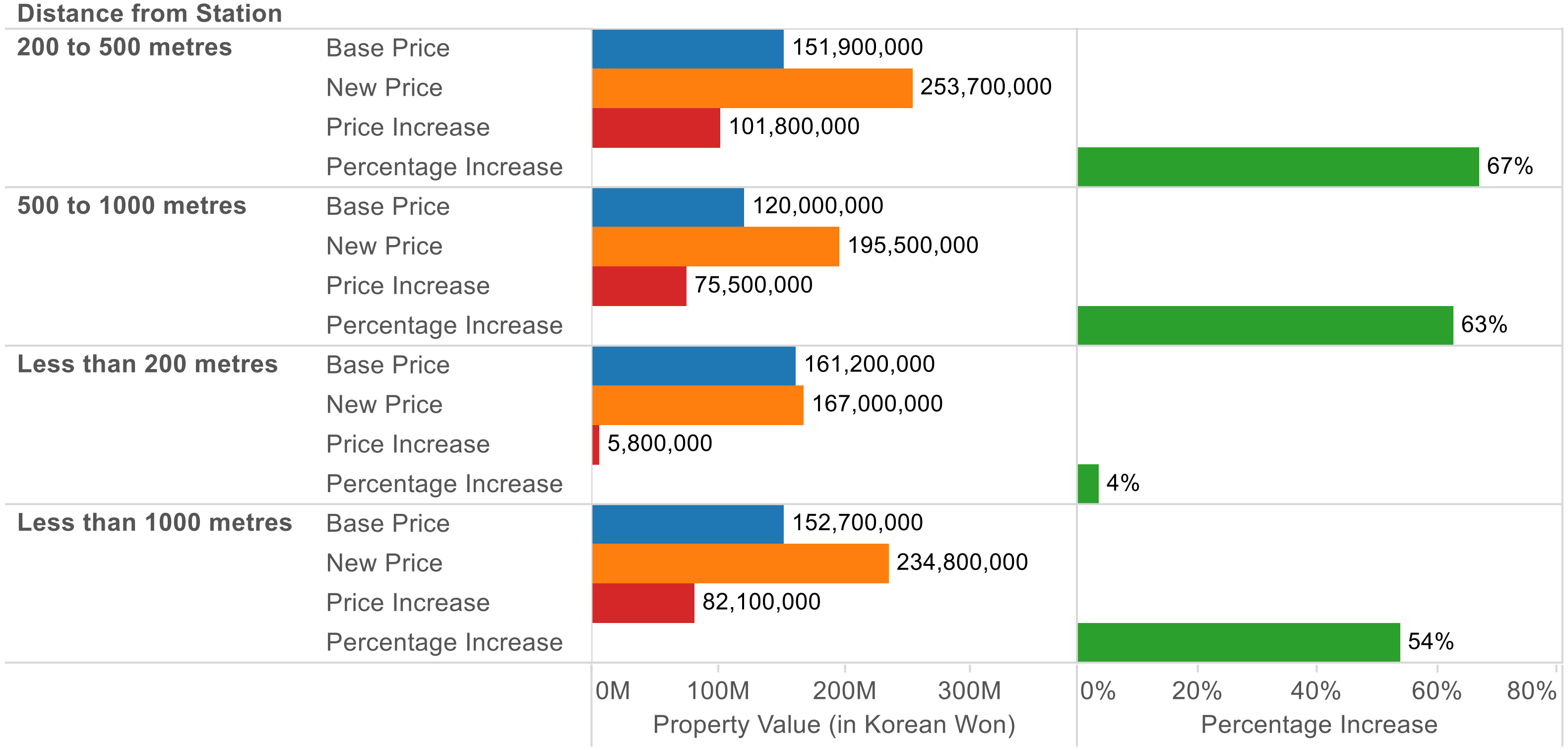


Figure 5. *Impact of Seoul Subway Line 5 on Surrounding Residential Unit Prices upon Line Completion. Data Extracted From (Bae et al., 2003)*

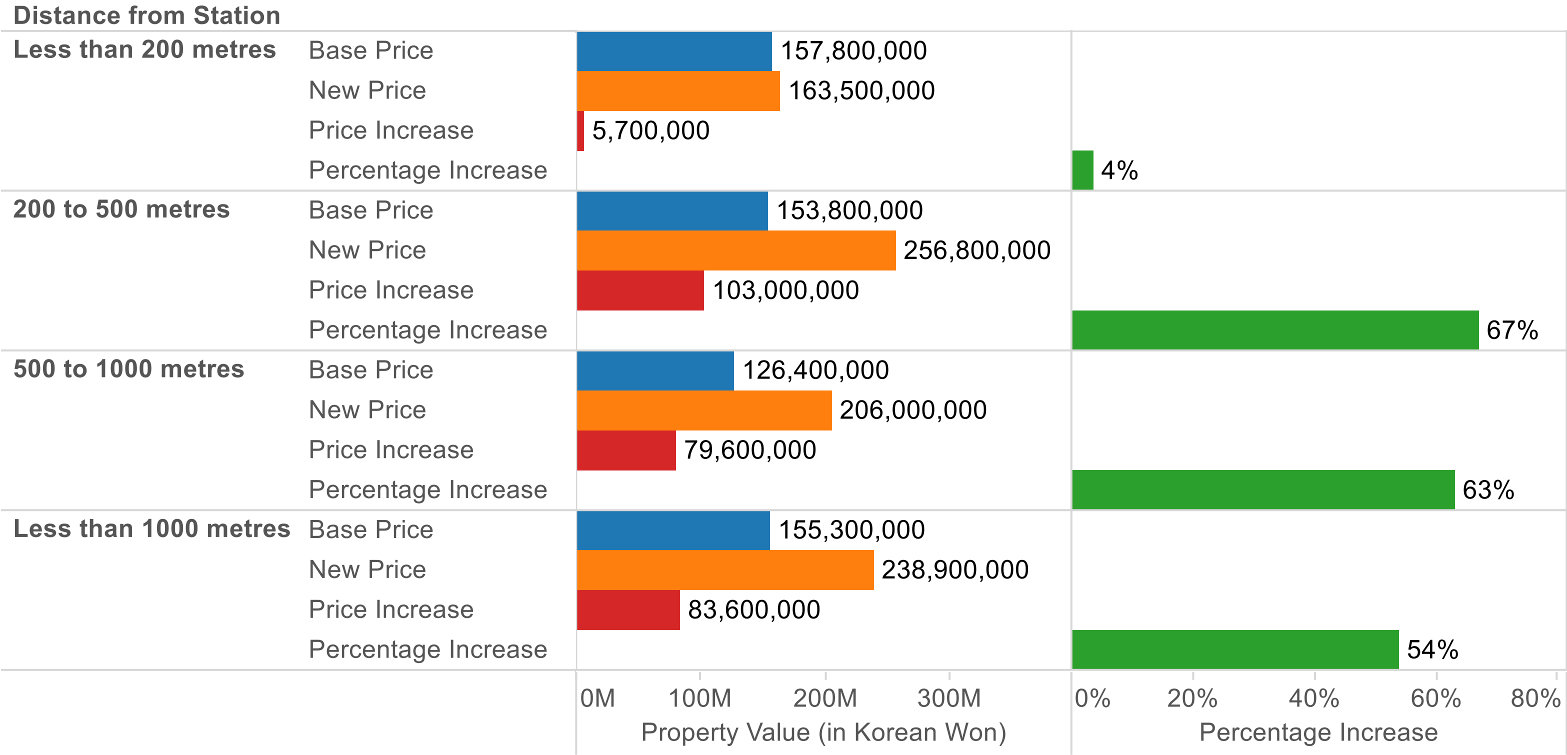


Figure 6. *Impact of Seoul Subway Line 5 on Surrounding Residential Unit Prices during the First Year of Operation. Data Extracted From (Bae et al., 2003)*

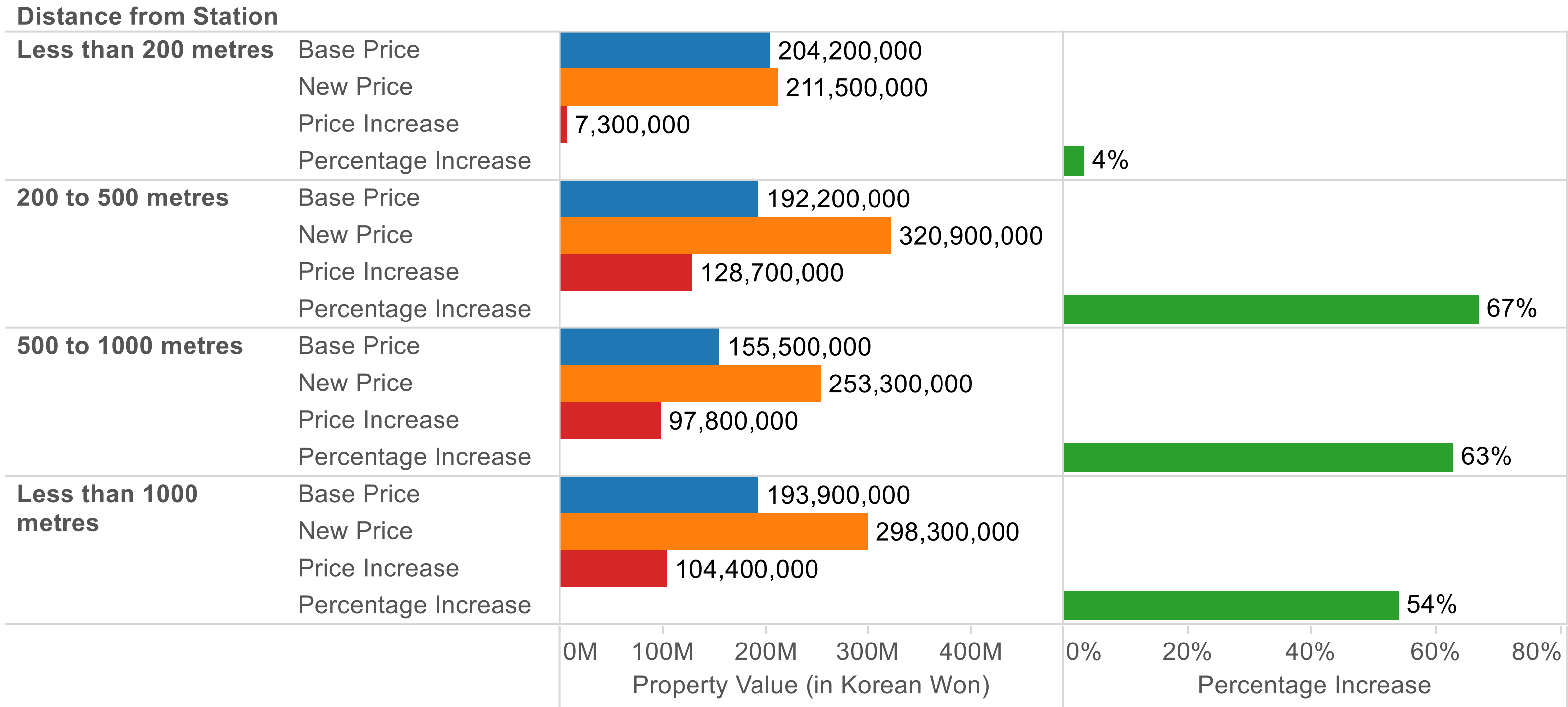
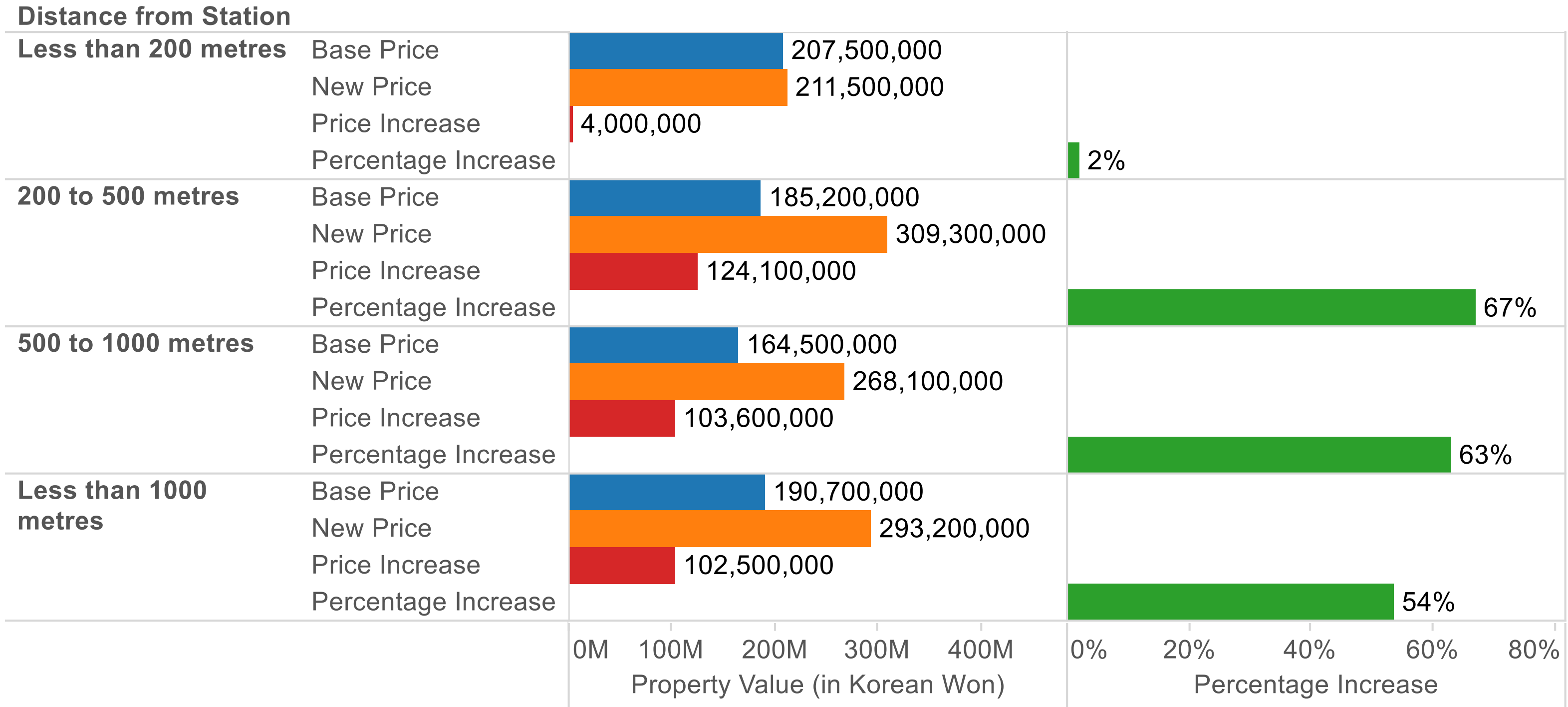


__Figure 7.__ Impact of Seoul Subway Line 5 on Surrounding Residential Unit Prices during the Third Year of Operation. Data Extracted From (Bae et al., 2003)



1.3.2. Transit Proximity Premiums and Property Types

Multiple studies have shown that residential properties closest to transit stations generally record lower transit induced land value uplift due to nuisance effects (Bae et al., 2003; Bowes & Ihlanfeldt, 2001; Chen & Dueker, 1997; Hess & Almeida, 2007; Landis et al., 1995; Pagliara & Papa, 2011). For residential properties, nuisance effects such as air pollution, noise pollution, and increased vehicular traffic, neutralize some of the capitalized land value gains from transit accessibility (Bae et al., 2003; Bowes & Ihlanfeldt, 2001; Chen & Dueker, 1997; Heres et al., 2013). However, Hess & Almeida (2007) suggest that the cumulative financial benefits of transit station proximity to nearby properties far outweigh the individual financial costs (nuisance effects) to the nearest properties.

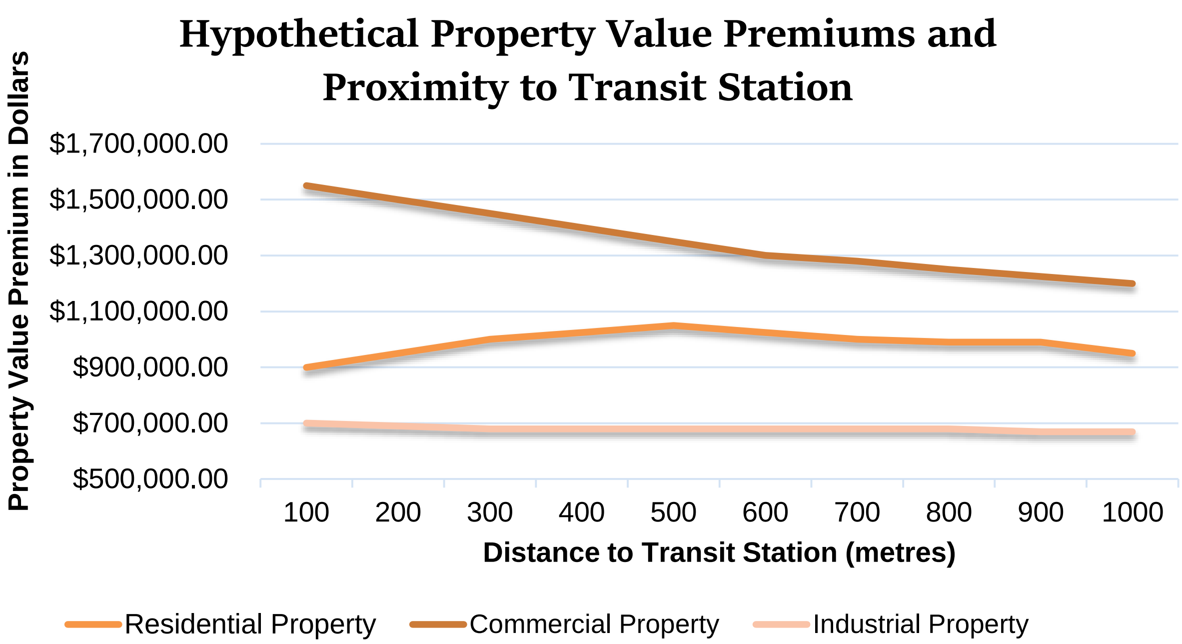


Figure 8. *A hypothetical graph illustrating the varied impacts of transit proximity on the values of different types of property*

The land value uplift of commercial properties (retail and office) nearest to transit stations, tends to be higher than that of residential properties (Cervero & Murakami, 2009; Cervero & Duncan, 2002; Cervero & Kang, 2011; Jones Lang LaSalle, 2013). Retail commercial space users prefer to be located close to transit hubs that provide access to a critical mass of transit riders with consumer needs (Bowes & Ihlanfeldt, 2001). Office commercial space users recognize the positive impact of transit accessibility on employee productivity and business competitiveness, thus they prefer to be located in buildings within walking distance of transit stations (Cervero & Duncan, 2002; Roukouni & Medda, 2012; Ryan, 1999). In contrast, as a factor determining industrial property values, transit accessibility benefits are not significantly important because transit accessible industrial areas and properties are typically pedestrian inaccessible (CPCS Transcom, 2011). Hence, the value uplift benefits of transit projects are typical low or insignificant.

1.4. Magnitude of Land Value Uplift and Transit Technology

To examine the relationship between transit investment impacts and land values, it is important to acknowledge the role of transit technology types in transit induced land capitalization. It is widely believed that the magnitude of land value uplift and land use change vary with the type of transit (Bowes & Ihlanfeldt, 2001; Cervero & Duncan, 2002; Landis et al.,1995; Ma et al., 2013; Suzuki et al., 2015). All else being equal, higher order transit modes tend to induce higher land value uplift and vice versa for lower order transit modes. This relationship can be explained in part by the level of accessibility benefits that different transit modes offer transit riders (Bowes & Ihlanfeldt, 2001; Cervero & Kang, 2011). Transit accessibility benefits are measured in terms of travel cost savings, reliability, travel time, speed, capacity, frequency, comfort, and walking distance to station. The level of transit accessibility benefits is typically measured by the number of jobs and households reachable within a certain amount of time during peak periods via transit relative to auto travel (Bowes & Ihlanfeldt, 2001; Hess & Almeida, 2007; Ma et al., 2013; Munoz-Raskin, 2010; Ryan, 1999).

Fixed guideway transit modes (Light and Heavy Metro) - are larger, higher performance, more expensive, and non-reversible types of transit investments (Suzuki et al., 2015). For this reason, they tend to confer higher and lasting accessibility benefits on individuals, and are widely believed to generate higher rates of land use change and value uplift for surrounding properties than regular street transit. (Bowes & Ihlanfeldt, 2001; Landis et al.,1995; Ma et al., 2013; Salon et al., 2014; Smith & Gihring, 2006). Unlike regular bus, Bus Rapid Transit (BRT) systems, which are operated at grade on segregated right of way (ROW), have been found to generate significant accessibility benefits (Heres et al., 2013; Munoz-Raskin, 2010), spur land use changes and transit oriented development (Wright, 2004), and generate significant land value premiums for surrounding properties (Rodríguez & Mojica, 2009; Rodríguez & Targa, 2004; Salon et al., 2014). Cervero & Kang (2011) posit that BRT investments, like rail investments, represent an appreciable improvement in transit service quality and an increase in accessibility benefits for surrounding properties from the perspective of developers and land owners. As such, properties located within rail and BRT benefitting areas potentially become prime locations for redevelopment.

Table 4. *A classification of transit modes by technology, right of way (ROW), service type, land use impacts, and land value impacts*

Transit Category	Transit Technology	Right of Way (ROW) Classification	Transit Performance/ Service Quality	Land Use Impacts	Land Value Impacts
Regular Street Transit	Regular Bus (Trolleybus, Express bus)	ROW C – No Segregation	Low - Moderate	Low - Moderate	Low - Moderate
	Bus Rapid Transit (BRT) and Light Rail Transit (LRT)	ROW B – Partial or Longitudinal Segregation. ROW A – Full Segregation in some cases	Moderate - High	Moderate - High	Moderate - High
Fixed Guideway Transit	Light Rail Metro and Heavy Rail Metro	ROW A – Full Segregation	High	High	High
Data Source: (Vuchic, 2007)					

1.4.1. Toronto's Sheppard Finch Corridor Case Study

The results of a Benefits study for the Sheppard Finch Transit corridor in Toronto conducted by Metrolinx supports the high order transit mode – high land value uplift hypothesis discussed in section 3.4. Although the study does not provide the methodology used to estimate the range of value uplift, the results show that investments in fixed guideway transit modes will potentially yield higher land value uplift for different property types located in larger impact areas (see table 5).

Table 5. *Value uplift potential of different types of transit alternatives for the Sheppard Finch corridor*

Technology	**Range**	**Bus**	**BRT**	**LRT (at grade)**	**LRT (grade separated)**	**Subway**	**Commuter Rail**
Maximum Station Impact Area (metres)		**100**	**400**	**500**	**600**	**800**	**800**
Zoning	**Property Value Uplift**						
Residential	**Low**	1%	2%	10%	15%	20%	20%
	High	2%	4%	25%	30%	50%	50%
Office	**Low**	1%	2%	10%	15%	20%	20%
	High	2%	4%	50%	30%	50%	50%
Retail	**Low**	1%	1%	10%	10%	7%	7%
	High	2%	2%	50%	50%	15%	15%
Industrial	**Low**	0%	0%	1%	1%	5%	5%
	High	1%	2%	2%	2%	5%	5%
Source: Metrolinx Sheppard-Finch LRT Benefits Case (Steer Davies Gleave, 2009)							

1.4.2. Global Research Studies

The results of the Sheppard Finch LRT benefits case study are not applicable to transit investments in all contexts. A review of different research studies on the impacts of different types of transit on land values was conducted but yielded mixed results owing to contextual factors and differences (see table 6). Aside from transit technology benefits, there are other factors that might influence the magnitude of the impacts that transit technologies have on local property values, or explain the disparity in the land value impacts of similar transit modes in different contexts (Suzuki et al., 2015). These factors include but are not limited to: local economic conditions, local geography, land use factors, planning policies, existing transport patterns, and transport policies (Mejia-Dorantes & Lucas, 2014). For example, low transit patronage and automobile dependence have been highlighted as likely explanations for low transit induced land value gains (Murakami, 2010; Schiff et al., 2012; Suzuki et al., 2015). Irrespective of contextual factors, it is interesting to observe in table 6 that some lower order transit modes induce higher land value increases than higher order transit modes. This implies that high order transit modes (example - rapid rail transit) do not always induce significant land value uplift in all cases despite their advantages.

Table 6. *Transit capitalization studies for different transit modes*

Location	Transit Technology	Transit Induced Land Value Uplift %	Impact Area (Metres)	Property Type	Author(s)
Cardiff, Wales (UK)	Regular Bus	0.15	≤ 1500	Residential	(Wang et al., 2015)
Quebec City, Canada	Regular Bus (Express Service)	1	≤ 400	Residential	(Rosiers et al., 2010)
Singapore	Regular Bus (Bus Interchange)	6.5	≤ 300	Residential	(Sue & Wong, 2010)
Bogota, Colombia	BRT	8	≤ 500	Residential	(Rodríguez & Targa, 2004)
Seoul, South Korea	BRT	10	≤ 300	Residential	(Cervero & Kang, 2011)
Seoul, South Korea	BRT	25	≤ 150	Commercial	
Bogota, Colombia	BRT	13.5	≤ 500	Residential	(Rodríguez & Mojica, 2009)
Guangzhou, China	BRT	28.8	≤ 500	Residential	(Salon et al., 2014)
Buffalo, New York	LRT	3.5	≤ 400	Residential	(Hess & Almeida, 2007)
Santa Clara County, California	LRT	23	≤ 400	Commercial	(Cervero & Duncan, 2002)
	LRT	120	≤ 400	Commercial (in CBD)	
Metro Vancouver, Canada	Light Metro	2.6	≤ 500	Residential (Single Family)	(Schiff et al., 2012)
	Light Metro	20	≤ 500	Commercial (Office)	(Jones Lang LaSalle, 2013)
Beijing, China	Heavy Metro	4.8	≤ 800	Residential	(Ma et al., 2013)

Location	Transit Technology	Transit Induced Land Value Uplift %	Impact Area (Metres)	Property Type	Author(s)
Warsaw, Poland	Heavy Metro	6.7	≤ 1000	Residential	(Medda & Modelewska, 2009)
Hong Kong	Heavy Metro	10.2	≤ 400	Residential and Commercial	(Cervero & Murakami, 2009)
Singapore	Heavy Metro	17.3	≤ 500	Residential	(Sue & Wong, 2010)
Guangzhou, China	Heavy Metro	34	≤ 500	Residential	(Salon et al., 2014)
San Francisco, California	Heavy Metro	100	≤ 300	Residential	(Landis et al. 1995)

2. Types of Transit Land Value Capture Instruments

Suzuki et al. (2015) argue that by applying the "beneficiary pay principle" to transport finance, transit agencies stand to recover the cost of transit infrastructure from property owners and developers - the main beneficiaries of transit induced land value uplift. Transit induced land value gains can be recovered using two types of LVC instruments for transit finance. They include:

A. Development Based Land Value Capture (DBLVC)
B. Taxation Based Land Value Capture (TBLVC)

2.1. Development Based Land Value Capture (DBLVC)

Development based Land Value Capture (DBLVC) is the type of LVC mechanism where transit agencies or transit investors are directly or indirectly involved in the delivery of development on land around transit stations (George Hazel Consultancy, 2013). "Transit investor" implies any of the following: (1) Special Purpose Vehicles/Enterprise (SPV/SPE) set up between governments, transit agencies, and private sector investors for joint transit project development (2) Independent private transit developers and operators (Suzuki et al., 2015).

A key requirement for Development based Land Value Capture is a new concept called *Transit Value Planning*. Transit Value Planning is an innovative approach to transit development that attempts to maximize value generation for transit projects (CPCS Transcom, 2011). To this end, transit investors assemble more land than is required for station development for the future development of high density properties (residential, commercial, and office) around station areas (within 500 metres) (Cervero & Murakami, 2008). By leveraging their ownership of excess development rights (land and air rights) around station areas using transanctionary mechanisms, transit agencies can be direct beneficiaries of the significant transit induced land value gains (Suzuki et al., 2015). Such financial gains can be used by transit agencies for transit investment cost recovery or reinvestment in transit construction, operation, and maintenance (Smith & Gihring, 2006). One main caveat is that DBLVC should not be considered as a sole source of funding for transit investments; it is used together with traditional funding sources (Suzuki et al., 2015).

2.1.1. Types of Development Based Land Value Capture (DBLVC)

DBLVC for transit finance can be applied in various ways:

I. Direct Property Development
II. Joint Property Development
III. Land Sales
IV. Air Rights Sale
V. Land Lease Agreements
VI. Land Readjustment
VII. Urban Redevelopment Schemes

I. Direct Property Development

This form of DBLVC entails the direct involvement of public transit agencies in property development on excess land around transit stations (George Hazel Consultancy, 2013). Direct property development has the potential to generate significant and lasting revenues for transit agencies. However, there are significant financial costs and risks associated with real estate development projects.

II. Joint Property Development

This form of DBLVC is where public transit agencies are directly involved in transit station development and adjacent property development in partnership with private developers (Gihring, 2009; Suzuki et al., 2015). Private developers make significant contribution towards the construction and financing of station facilities (Medda, 2012). The potential land value gains generated by the transit project incentivizes private developers to enter into joint development ventures with transit agencies on transit adjacent properties (Suzuki et al., 2015). Joint development usually involves a cost and revenue sharing arrangement between public and private entities. (Mathur & Smith, 2013). Cost and revenue sharing in joint development usually occur in different forms including:

- *Incentive-based agreements:* Special privileges such as a density bonus are granted to the developer by the government and transit agency in exchange for financial contributions towards transit infrastructure construction (Mathur & Smith, 2013) or the construction of transit station(s) as part of their development (Salon & Shewmake, 2011).
- *Voluntary agreements* (including construction cost sharing and operations cost sharing): Developers and transit agency venture into agreements that reduce the infrastructure and property development costs and risks borne by both parties. Transit agencies and developers, for example, can enter into agreements to manage and finance the planning, construction, operations, and maintenance of transit infrastructure and adjacent real estate (Mathur & Smith, 2013).
- *Equity participation and Revenue Sharing:* Contribution towards construction costs is required of the transit agency and the developer(s). Revenues from development are shared between both parties based on the percentage of equity contributed or the amount of risk borne by each party (Mathur & Smith, 2013). For this reason, joint development is the most compatible LVC instrument in Public Private Partnerships (PPP) transit finance agreements because of its ease of implementation under PPP contractual

frameworks (Medda & Modelewska, 2009; Medda, 2012). However, joint development ventures are also susceptible to disputes over costs and benefits allocation (Ingram & Hong, 2011).

III. Land Sales

The public transit agency sells excess acquired land or development rights around transit infrastructure at appreciated (post rail investment) land prices to developers to raise significant upfront revenues to finance transit investments. However, supportive land use regulations are necessary for the agency to sell the property at high market value. (Medda & Modelewska, 2009; Suzuki et al., 2015).

IV. Air Rights Sale

The transit agency sell the development rights above stations and transit adjacent land to developers to raise funds to finance transit investments (Levinson & Istrate, 2011). The developable space above station and station-adjacent land is increased beyond the allowable floor space ratio (FSR) in the land use designation to unlock additional financial land value, which is then captured by the transit agency through sales to developers (Suzuki et al., 2015). The transit accessibility benefits that accompany the air rights are also reflected in the sales price.

V. Lease Agreements

The transit agency or investor leases valuable land, or space above or below the land adjacent to transit stations to developers in return for annual land rents and or a single leasehold payment (Levinson & Istrate, 2011; Mathur & Smith, 2013; Suzuki et al., 2015). This includes air rights leases, ground leases, or subterranean leases.

VI. Land Readjustments

This is a DBLVC mechanism whereby individual land owners in a transit investment area (station area) pool their land together into a large site for redevelopment and in the process donate a portion of the assembled land to the government in exchange for zoning relaxation on the consolidated site (Smolka, 2013). More specifically, land readjustment schemes in transit finance are used by government and transit agencies to assemble excess right of way for transit projects at little or no cost (Ingram & Hong, 2011). A portion of the land is used for transit station development, while the remainder is sold at market value or developed – both actions allow transit agencies to defray the high land acquisition and construction cost of transit infrastructure (Suzuki et al., 2015). Land readjustments schemes have been used extensively by transit agencies and governments in Japan, Korea, Taiwan, and India (for non-transit purposes) (Ingram & Hong, 2011; Suzuki et al., 2015).

VII. Urban Redevelopment Schemes

This is a unique DBLVC mechanism for transit finance where transit agency and government increase the allowable floor space in a newly assembled redevelopment site and then sells excess floor space to new property owners to fund transit infrastructure in the area (Cervero & Murakami, 2007; Suzuki et al., 2015). The consolidation of individual parcels into a large redevelopment site by group of individual land owners in a transit investment area in partnership with a developer is a prerequisite for the approval and sale of excess floor space to fund transit infrastructure (Cervero & Murakami, 2008; Suzuki et al., 2015). To facilitate the redevelopment process, the partner developer can temporarily take on responsibility for all the land owners and tenants during the approval and transaction process. This type of DBLVC mechanism is used primarily in Japan (Suzuki et al., 2015).

The advantages and disadvantages for each type of DBLVC mechanism are summarized in table 7 and will be discussed further in section 2.1.2

Table 7. *Advantages and disadvantages of each type of DBLVC instrument for transit finance*

DBLVC Mechanism	Advantages	Disadvantages
Direct Property Development	• Significant and long term revenues from development ventures	• Exposure to significant financial costs and risks associated with property investment and development. • Requires zoning regulations that permit highest and best use land development

DBLVC Mechanism	Advantages	Disadvantages
Joint Property Development	• Significant revenues from joint development ventures • Incentive based • Risk and benefits sharing • Most compatible for PPP financed transit projects	• Partner disagreements over cost and revenue allocation • Requires zoning regulations that permit highest and best use land development
Land Sales	• Generation of significant upfront revenues • Low financial risk	• Revenues dependent on the amount of land development rights, the nature of land use regulations, and urban land market activity • High land acquisition costs
Air Rights Sale	• Generation of significant upfront revenues • Low financial risk	• Zoning relaxation is required to increase allowable floor space area above ground
Lease Agreements	• Generation of upfront and recurrent revenues • Low financial risk	• Revenue yield low in comparison to other DBLVC instruments and the sheer cost of urban transit investments
Land Readjustment	• Zero land acquisition due to land contribution from land readjustment • Revenues or cost savings for transit project development	• Highly dependent on private land owners consent and support • Financial risk associated with post readjustment transit agency led property development • Only feasible on land located in the urban fringe • Highly dependent on local planning and urban development policy
Urban Redevelopment Schemes	• Proceeds from the sale of increased development right accrue to the agency and local governments for transit investment	• Land Assembly and Land Contribution are highly dependent on cohesion between the private land owners and developer(s)

DBLVC Mechanism	Advantages	Disadvantages
	• Suitable on urban land or built up areas	• Zoning relaxation is required to increase allowable floor space area above ground developer and individual land owners • Highly dependent on local planning and urban development policy
Sources: (Cervero & Murakami, 2009; Cervero & Murakami, 2008; George Hazel Consultancy, 2013; Gihring, 2009; Ingram & Hong, 2011; Levinson & Istrate, 2011; Mathur & Smith, 2013; F. Medda, 2012; Salon & Shewmake, 2011; Smolka, 2013; Suzuki et al., 2015)		

2.1.2. Advantages of Development Based Land Value capture (DBLVC)

I. **High Revenue Potential**: DBLVC mechanisms have greater potential to generate significant revenues to fund capital intensive transit investment and transit operations – without creating market distortions and public opposition (Suzuki et al., 2015). DBLVC mechanisms – particularly in the case of direct and joint development - can generate significant and lasting revenues for transit agencies through:

- Economic rents from commercial (retail and recreational facilities) and residential property development on transit adjacent land (Cervero & Murakami, 2008)
- Transit Oriented Development (TOD) and Transit Oriented Corridor (TOC) induced increase in transit system ridership and farebox revenue (Appleyard, 2003).

II. **Low Political Risk:** DBLVC involves relatively lower political risk than TBLVC due to the low likelihood of public opposition to financially beneficial land and development transaction

III. **Partnership and Financial Benefits Sharing:** DBLVC mechanisms for transit finance are market oriented tools based on the partnership between agency and private partners – private land owners, developers, and commercial entities - in sharing land value gains through mutually beneficial land and development transactions as opposed to exactions. This is done primarily through the provision of significant development land and air rights for private partners, and the sharing of land value gains with private partners (Mathur & Smith, 2013).

2.1.3. Disadvantages of Development Based Land Value Capture (DBLVC)

I. **Susceptibility of Revenues:** Revenues from development ventures and the sale of development rights are vulnerable to changes in land and real estate market prices – which are primarily influenced by the level of property demand and development activity (Mathur & Smith, 2013; Suzuki et al., 2015).

II. **Financial Risk:** Financial risks are incurred by public transit agencies involved in DBLVC through direct and joint property development ventures owing to changes in real estate demand and prices (market cycles) (Cervero & Murakami, 2008).

III. **Cost of Implementation:** DBLVC mechanisms typically entail high transaction costs (examples – land acquisition costs, construction cost, and administrative costs), significant land contributions (a cost to the developer or land owner); and the depletion of limited and valuable pubic land (Suzuki et al., 2015).

IV. **Household Affordability and Gentrification:** Increases in land values due to transit investment and agency led transit adjacent development displaces low income households in the investment area. Housing becomes unaffordable in the absence of supportive government policies to preserve affordability or the provision of affordable housing options as part of DBLVC schemes (Suzuki et al., 2015).

V. **Transparency:** Public concerns about the transparency of the process will likely arise particularly when the negotiation between the agency and private partners in DBLVC mechanism are conducted far from the public eye or without public participation (Cervero & Murakami, 2008; Medda, 2012).

VI. **Property Development Expertise:** For DBLVC to be successfully implemented by public transit agencies, it is important that they have the capacity and expertise to take on complex land transactions and property development projects. Transit agencies are increasingly beginning to hire real estate professionals to fill the development expertise gap. More entrepreneurial thinking is required of transit planners in agencies to be able to deliver expensive transit projects that are financed using complex DBLVC mechanisms (Suzuki et al., 2015).

2.2. Taxation Based Land Value Capture (TBLVC)

Taxation based land value capture (TBLVC) is the type of LVC instrument that is used to recover transit induced value gains by imposing taxes or fees on existing developments located in 'transit investment benefitting areas" established by the transit agency. (Medda & Modelewska, 2009; Walters, 2012). TBLVC mechanisms can be used to recover as high as 60 percent of land value gains, and they are used alongside traditional transit funding sources (Suzuki et al., 2015). In most cases, public transit agencies require legislative authority to use TBLVC except if it is conducted through voluntary compliance (George Hazel Consultancy, 2013).

2.2.1. Types of Taxation Based Land Value Capture (TBLVC)

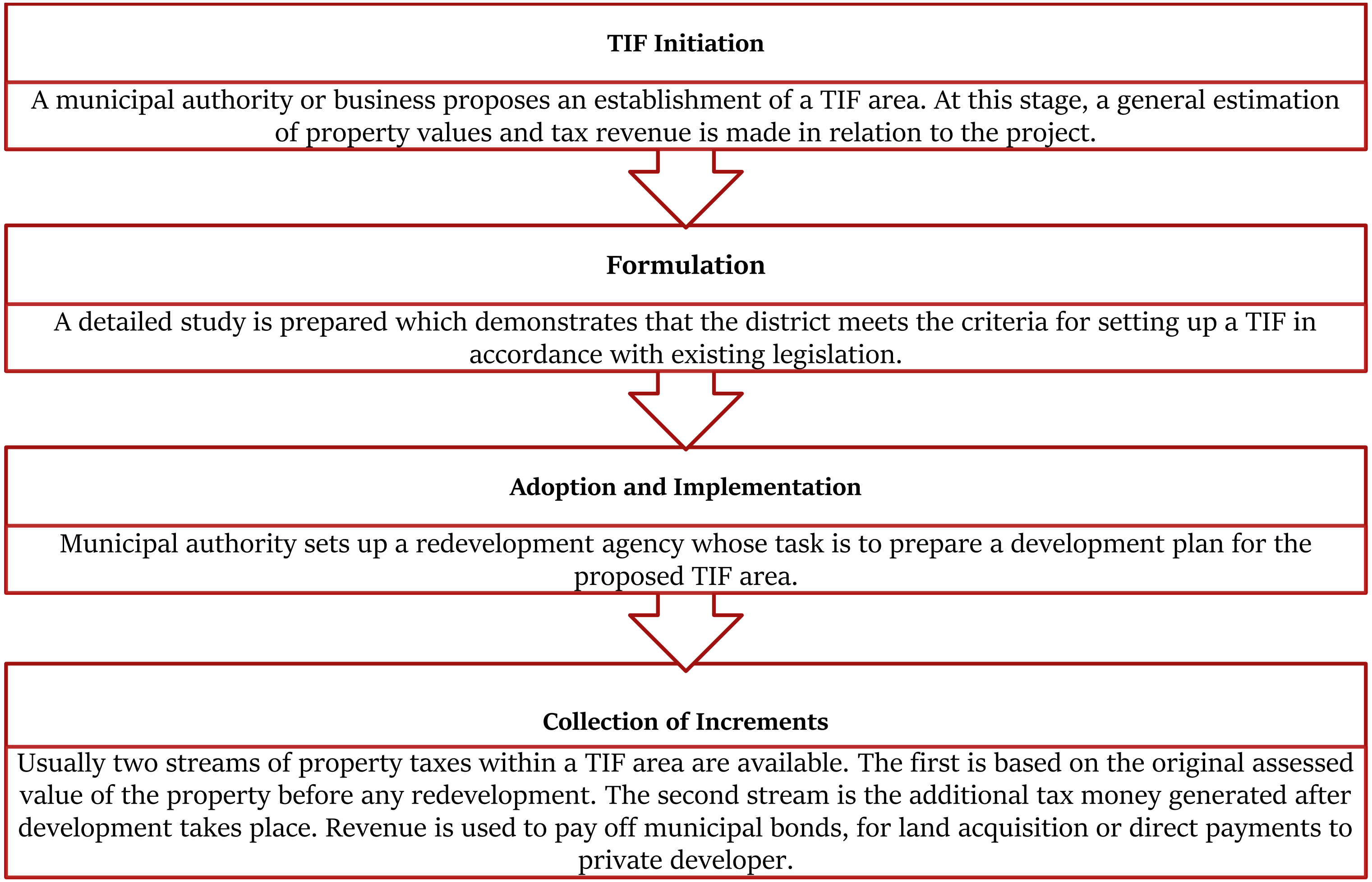
TBLVC for transit finance can be implemented through different mechanisms:

I. Tax Increment Financing (TIF)
II. Special Assessments
III. Land Value Taxes (LVT)
IV. Betterment Charges
V. Impact Fees
VI. Station Connection Fees

I. Tax Increment Financing (TIF)

Tax Increment Financing (TIF) is a funding mechanism that uses predicted future growth in annual property tax revenues triggered by transit induced property value increases, to finance current transit infrastructure investments in a development area (Gihring, 2009; Medda & Modelewska, 2009; Zhao et al., 2012). Bonds are issued to borrow against anticipated growth in property tax revenues and are retired in phases as the tax increments are generated and collected (Levinson & Istrate, 2011). As a value capture funding source, TIF also uses fiscal incentives (tax breaks, tax reliefs) to encourage urban development in specific areas; and it is capable of financing part of the costs of transit investments (Medda & Modelewska, 2009).

Figure 9. *The tax increment financing process. Adapted from (Medda & Modelewska, 2009)*



II. Special Assessments

Special Assessments are fees levied by transit agencies on properties that directly benefit from transit induced land value gains, which is used to finance transit investments (Gihring, 2009; Zhao & Larson, 2011). In principle, the direct special benefits of the transportation investment enjoyed by properties within a Special Assessment District (SAD) exceeds the benefits enjoyed by the general public, and must be clearly identified and measured (Zhao et al., 2012). In transit value capture, SADs are also be referred to as transportation improvement districts (TID), benefit assessment districts (BAD), local improvement districts (LID), or business improvement districts (BID) (Zhao & Larson, 2011).

III. Land Value Taxes (LVT)

Land value taxes (LVT) or "split rate property taxes" are imposed by governments for the sole purpose of capturing land value gains created by transit investments (Gihring, 2009; Zhao et al., 2012). They are levied in addition to property taxes, which apply to all properties (Smolka, 2013). The broader definition of land value tax make it difficult to be used to fund transportation projects solely because they are included in the general pool of tax revenues used for all types of public investment (Levinson & Istrate, 2011).

IV. Betterment Charges and Contributions

Similar to special assessments, betterment charges are surtaxes on the estimated benefits of transit investment assessed by government and levied on property owners who directly benefit from transit investments, to fund transit infrastructure costs (Medda & Modelewska, 2009; Smolka, 2013; Suzuki et al., 2015).

V. Impact Fees

Impact fees are LVC instruments that are used to ensure that new development bears the full capital cost of any new infrastructure that is required to support it (Levinson & Istrate, 2011). Impact fees are specifically imposed on new development that will benefit from transit investment in an area. They can be used by transit agencies and government to defray the cost of extending transit infrastructure to new development area (Gihring, 2009). Furthermore, a key requirement for imposing impact fees is that they must be backed by legislation that ties the need for new transit infrastructure to the new development (Ingram & Hong, 2011). An example of an impact fee for capturing land values could be a regional transit development cost charge (TDCC) charged by a regional transportation agency to new developments and redevelopments in clearly established transit benefitting areas in the region .

VI. Station-connection fees

Station connection fees are levied by transit agencies on property owners or leasers in a transit benefitting area to cover the associated costs of providing transit station accessibility through station construction, which in turn increases their property values (Mathur & Smith, 2013).

The advantages and disadvantages for each type of TBLVC mechanism are summarized in table 8 and will be discussed further in section 4.2.2

Table 8. *Advantages and disadvantages of each type of TBLVC instrument for transit finance*

TBLVC Mechanism	**Advantages**	**Disadvantages**
Tax Increment Financing (TIF)	• High propensity to trigger redevelopment • Low political risk as additional property tax is not required • Generation of critical future revenues for current investments	• Strong urban land and real estate market is required • Significant time required for TIF negotiation • Size of TIF district affect the amount of revenues generated – large scale TIF districts are required significant funding targets or objectives • Interest costs and financial risk associated with borrowing against future increments in property values – especially if the increments do not materialize

TBLVC Mechanism	Advantages	Disadvantages
		• Potential costs associated with TIF – land acquisition, debt servicing, and direct payments to developer
Land Value Tax	• High revenue yield as the taxable geographic area is typically large	• Difficult to dedicate revenues solely to transit investments • Delineation of transit induced value increments from non-transit induced land value increments • High political cost as a result of public opposition • Intergovernmental corporation
Special Assessments **Betterment Charges** **Impact Fees**	• Efficient LVC tools as they are levied on individual properties that benefit directly from transit infrastructure • Generation of additional revenues for transit investments • With proper legislation, revenues generated can be put towards transit investments alone • When necessary, they can be negotiated and paid as voluntary contributions to the government by land owners and developers	• Revenues generated from property owners are highly dependent on local economic conditions – weak economy versus. strong economy • Uncertainty around the land value impacts of a transit project • High level of imprecision associated with conventional methods used to determine transit induced property value uplift (real and projected) • Size of special assessment district (SAD)/betterment area/impact area affect the amount of revenues generated – large scale SAD are required for expensive transit projects with high LVC funding objective • Interest costs associated with borrowing funds for project before revenues are collected at year end. • Collection of revenues in a benefitting area is typically limited to a specific period of time set by law

TBLVC Mechanism	Advantages	Disadvantages
		(in the case of special assessments and betterment charges) • High political cost (public opposition) associated with imposing fees and taxes • Revenue size is affected by the level of economic activity - employment levels and income levels affect the demand for properties and the price (value) of properties
Sources: (George Hazel Consultancy, 2013; Gihring, 2009; Ingram & Hong, 2011; Kitchen & Lindsey, 2013; Mathur & Smith, 2013; Medda & Modelewska, 2009; Rybeck, 2004; Salon & Shewmake, 2011; Smolka & Furtado, 2002; Smolka, 2013; Translink, 2014; Walters, 2012; Zhao et al., 2012; Zhao & Larson, 2011)		

2.2.2. Advantages of Taxation Based Land Value capture (TBLVC)

I. **Low Financial Cost of Implementation:** TBLVC mechanisms enable transit agencies and governments to generate significant revenues in addition to traditional funding sources for transit projects without depleting expensive and limited public land assets (Suzuki et al., 2015).

II. **Recurrence:** TBLVC instruments can be applied to transit benefitting properties multiple times over a long period of time in order to generate significant revenues to be put towards transit project funding. These long term revenues that can either be used to subsidize transit operation and construction or leveraged to acquire debt financing for transit capital expenditure (Salon & Shewmake, 2011).

III. **Limited Financial Risk:** The use of TBLVC enables transit agencies to avoid the financial risk associated with property development and management in direct and joint development. However, some risks are incurred in TBLVC mechanisms especially where TBLVC revenues are borrowed against before their collection (Gihring, 2009; Suzuki et al., 2015).

2.2.3. Disadvantages of Taxation Based Land Value capture (TBLVC)

I. **Land Value Uplift Estimation:** Estimating the precise financial amount of taxable land value gains that nearby properties stand to benefit from transit investments can be challenging due to methodological limitations, as such disagreements between governments and property owners over the real value of transit accessibility land capitalization are likely to arise (Hallegatte & Viguie, 2014; Ingram & Hong, 2011; Suzuki et al., 2015).

II. **Property Market Distortion:** If applied in sizable development areas at once, the risk of property market prices and rent increasing could be high. Exemptions might be required for certain types of property or smaller development areas that directly benefit from particular type of public transit investment (for example – rapid rail transit) (Ingram & Hong, 2011).

III. **High Political Risk:** The likelihood of public and key stakeholder opposition to additional taxes or charges for transit land value capture finance is high, making implementation difficult to achieve (Zhao & Larson, 2011).

IV. **Gentrification:** Transit induced property value gains that agencies attempt to capture through taxation, often displace low income households in transit benefitting areas in the absence of housing affordability strategies (Suzuki et al., 2015).

2.3. Development and Taxation Based Land Value Capture: A Combination

It is important to note that land value capture mechanisms are flexible in that they can be designed to include development based land value capture (DBLVC) instruments and taxation based land value capture (TBLVC) instruments (George Hazel Consultancy, 2013). A major advantage of such a combination is that it focuses on the core strengths of DBLVC and TBLVC in a way that offsets the weaknesses of both types of instruments, in order to achieve a transportation funding objective.

3. Global Practice Review of Transit Land Value Capture Project Finance

Land Value Capture (LVC) has been used by numerous transit agencies to finance capital intensive transit investments. To demonstrate the transit funding potential of LVC within the limited length of this report, examples of global transit projects that have employed transit value capture mechanisms in project financing are summarized comprehensively in table 9. Furthermore, three case studies are discussed in greater detail in the next section.

Table 9 *Global review of transit projects funded using land value capture mechanisms*

Transit Project	Length (Km)	Project Duration	Project Cost	LVC Mechanism	Specific Tool Applied	LVC Revenues as a Percentage of Project Cost
Jubilee Line Extension – London UK	16	1992 - 2000	$5.3 billion (estimated value uplift associated with project – $19 billion)	TBLVC	Betterment Charges	10%
Copenhagen Metro M1 line extension - Orestad Station Development	14.2	2002 - 2007	$2 billion	Combination	Sale of Development Rights (Land and Air) for project investment; Land Value Tax (LVT) for project operations	20% (Land and Air Rights Sales – 10%; LVT – 10%)
Nanchang Metro Line 1 – Nanchang, China	28.7	2008 - 2015	$1.3 billion	DBLVC	Direct Property Development	15.1%
Crossrail - London UK	118	2009 – 2018 (expected)	$22.6 billion	TBLVC	Betterment Charges – "Business Rate Supplements" (BRS)	27%
Delhi Metro Phase I, II, III expansion - Delhi, India	234	1995 – 2016 (expected)	$12 billion	DBLVC	Direct Property Development	4.9%

Transit Project	Length (Km)	Project Duration	Project Cost	LVC Mechanism	Specific Tool Applied	LVC Revenues as a Percentage of Project Cost
Portland MAX Red Line Airport Extension	8.9	1999 - 2001	$125 million	Combination	Land Lease and Tax Increment Financing (TIF)	41% (Lease – 22.6%; TIF – 18.4%)
Hong Kong MTR South Island East Line	7	2007 – 2016 (expected)	$1.59 billion	DBLVC	Joint Property Development	79.6%
The Portland Streetcar Extension (The Loop)	5.3	2009 - 2012	$148.3 million	TBLVC	Special Assessment District	10.8%
Hong Kong MTR Kwung Tong Line Extension	2.6	2011 – 2016 (expected)	$683 million	DBLVC	Joint Property Development	62%
Washington Metro Silver Line – Washington DC	37	Phase 1: 2008 – 2014 Phase 2: ongoing	$6 billion	TBLVC	Special Assessment Districts	16.8%
Yokohoma MM21 Line – Tokyo, Japan	4.1	1992 - 2004	$2 billion	DBLVC	Land Readjustments	29%
Data Sources: (George Hazel Consultancy, 2013; Gihring, 2009; Medda & Modelewska, 2009; Suzuki et al., 2015)						

3.1. Transit Land Value Capture Finance Programs: Highlighted Cases

Three cases studies of transit operators and urban regions that have formerly incorporated LVC as part of their transit funding model are listed in table 10.

Table 10. *A table of transit agencies and transit value capture programs or projects highlighted in this report*

Region	Agency	Type of LVC	Mechanism Used	Land Tenure System
Nanchang, China	Nanchang Railway Transit Group	DBLVC	Direct Development	State leasehold
Hong Kong – SAR	MTR Corporation	DBLVC	Joint Development	State leasehold
London, UK	Transport for London (TfL)	TBLVC	Betterment Charges	Market freehold

3.1.1. Nanchang Railway Transit Group, Nanchang, China

Box I. *Nanchang Railway Transit Group Direct Property Development for Nanchang Metro Lines 1 and 2 project*

LVC Category: Development Based Land Value Capture (DBLVC)

Mechanism Used: Direct Property Development

Incorporated in 2008, the Nanchang Railway Transit Group (NRTG) in Nanchang, China adopted DBLVC as part of the funding strategy for the Nanchang Metro Line 1 (28.7 kilometres), Line 2 (23.3 kilometres), and Line 3 (18 kilometres) with full support from the Nanchang Municipal Government (NMG). NRTG's DBLVC approach involves direct property development on excess land around transit stations acquired through the NMG public land leasing scheme during transit construction.

Key Stakeholders

- **Nanchang Municipal Government (NMG)**
- **Nanchang Railway Transit Group**
- **Private Developers**

How the Nanchang Railway Transit Group (NRTG) Direct Property Development program works

Upon acquisition or lease of excess land by the NRTG from the Nanchang Municipal Government (NMG), the government in return increases the allowable floor space within 500 metres of stations to make DBLVC ventures profitable. It employs transit oriented development principles on transit adjacent land to generate real estate revenues for transit construction and operation. NRTG develops above ground and underground development at select rail stations. As a business policy, it first develops high density mixed use development around station areas that are close to the city center, and then replicates similar developments on a small scale at station areas located in the suburbs to improve the overall financial viability of direct property development ventures. NRTG is developing 23 mixed development above stations, five of which are being directly financed and developed, while the other 18 developments are being co-financed and developed with private developers. In addition, NRTG is building five underground developments, three of which will be directly finance and developed, while two will be co-financed and developed with private developers.

Financial Performance

NRTG's estimated investment in direct development schemes is $1.4 billion dollars. However, the expected revenues from the overall development scheme for 2012 – 2015 period include:

- **Sale of development rights** - $574 million
- **Sale of 500,000 square metres of commercial property** – $1.5 billion dollars
- **Average annual rental income** - $65.6 million dollars
- **2012 – 2015 Annual rental income** - $198 million
- **Projected 2015 net profit** – $1.1 billion dollars (20.5 percent of construction cost of line 1 and 2)

Overall, the projected financial benefits of NRTG's future real estate investments (including land development, station rental, property sales, and property lease) along the Nanchang Line 1 and Line 2 rail corridors will be $2.2 billion for the 2012-2016 period; and $3.6 billion for the 2012-2020 period. NRTG's DBLVC program is a model for other Chinese cities considering transit value capture finance.

Data Source: *(Suzuki et al., 2015)*

3.1.2. Mass Transit Railway (MTR) Corporation, Hong Kong - Rail plus Property (R+P) model

Box 2. *Hong Kong MTR Corporation Rail plus Property program*

LVC Category: Development Based Land Value Capture (DBLVC)

Mechanism Used: Joint Property Development

The Hong Kong Mass Transit Railway (MTR) Corporation has long utilized DBLVC in addition to other funding mechanisms to finance capital and operating transit investments. Excess land and development rights are sold to MTR by the Hong Kong government at "pre rail transit investment" market prices or transferred in-kind to the MTR by the government towards capital intensive rail transit projects.

Key Stakeholders

- **The Government of Hong Kong Special Administrative Region (SAR)**
- **Mass Transit Railway (MTR) Corporation**
- **Private Developers**

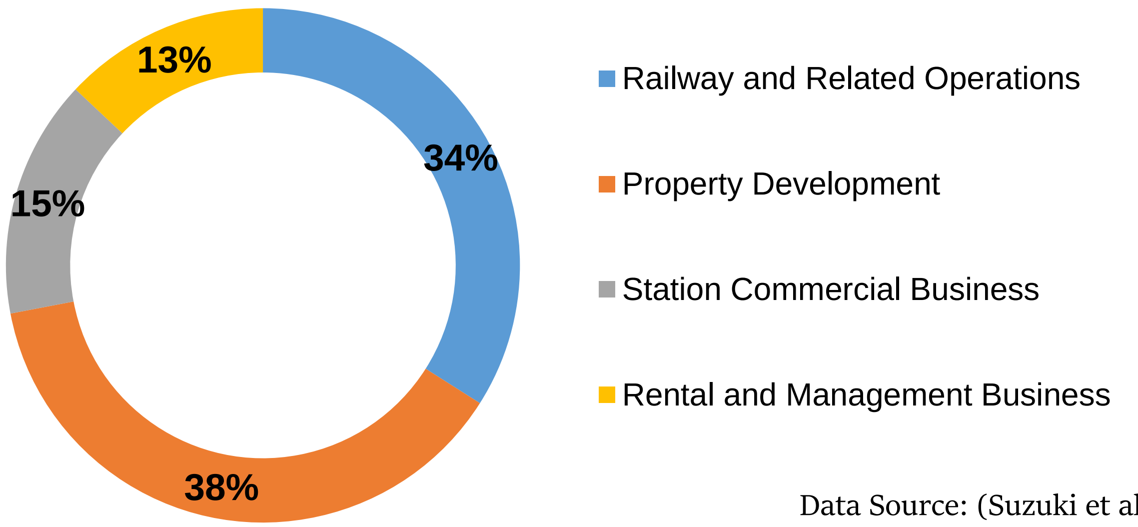
How the MTR Rail and Property Joint Development Program works

Through the Rail plus Property (R+P) program, MTR primarily engages in property development and management with preferred private developers (Joint development) on acquired excess public land and airspace adjacent to stations on its extensive rail transit network – 218 kilometers in length. As a policy, MTR does not often sell excess acquired land and development rights to private developers in order to retain full control of development and sale of completed units. However, the difference between pre and post rail investment market land prices in Hong Kong are often significant and sufficient to cover rail transit investments. Accordingly, MTR sells development rights to private developers at post rail investment market prices in return for a negotiated share of property development profits and/or joint ownership of the development. MTR's share of R + P development profits generated before and after the completion of a rail project need to be sufficient to cover the project funding gap estimated by MTR and project surveyors. For R+P to be financially viable ventures for transit finance, MTR typically require a minimum floor space ratio (FSR) of 4.0. Critical to the success of MTR's R+P program are Real Estate Portfolio Diversification and Project Phasing. MTR invests in the development of different type of properties – residential, retail, office commercial, and industrial - to hedge against potential declines in the demand profile, price, and rent of a specific type of property. It also adopts a phased approach to property development to offset the financial risks associated with real estate market cycles.

Financial Performance

Rail and Property (R+P) development has allowed the MTR to continuously generate significant revenues (real estate income) to recoup capital and operating investments in transit without increasing transit fares (see chart below). It is estimated that between 1980 and 2005, the Hong Kong Government and the public directly earned an estimated $18 billion in net financial returns (nominal value) from MTR's R+P program.

Percentage Share of MTR Corporation Net Income between the year 2000 and 2012



Data Source: (Suzuki et al., 2015)

In 2014, MTR Corporation real estate ventures generated the following revenues in 2014:

- **Hong Kong Station Commercial Business:** $640 million dollars (8% increase from 2013)
- **Property Rental and Management:** $540.3 million dollars (11% increase from 2013)
- **Property Development:** $544 million dollars (202% increase from 2013)

Passenger ridership and farebox revenue on the MTR's transit network has increased significantly overtime due in no small part to the agency's strategic investment in high density mixed use developments with valued destinations around rail stations and along rail corridors. Revenues from MTR's Transit Operations for 2014 was $2.09 billion dollars (a 7 percent increase from 2013 revenues). MTR currently enjoys a farebox recovery of 186 percent – one of the highest in the world.

Data Sources: (Cervero & Murakami, 2009; Cervero & Murakami, 2008; Hui et al., 2004; MTR Corporation, 2015; Salon & Shewmake, 2011; Suzuki et al., 2015)

3.1.3. Transport for London (TfL), London, UK– Crossrail Business Rate Supplement (BRS)

Box 3. *Transport for London's Crossrail Business Rate Supplement (BRS) scheme*

LVC Category: Taxation Based Land Value Capture (TBLVC)

Mechanism Used: Betterment Charges

In 2010, the Greater London Authority (GLA) and Transport for London (TfL) introduced a betterment charge called the Business Rate Supplement (BRS) to generate revenues to fund some of the cost of the London Crossrail project. Crossrail is a 118 kilometres East-West commuter line that will provide connection between the outlying suburbs located West, North East, and South East of Greater London through Central London. It is projected to transport 1.5 million passengers per hour, and increase Greater London's rail capacity by 10 percent. In addition, it is projected to contribute £1.24 billion pounds ($1.9 billion dollars) annually to London's economy. It is scheduled to commence revenue service in 2018.

Key Stakeholders

- **Commercial and Non-Residential Property Owners**
- **Transport for London (TfL)**
- **Greater London Authority (GLA)**

How the Crossrail Business Rate Supplements (BRS) works

The Crossrail BRS rate is 2 pence (£0.02) per pound of property ratable value, which means 2 percent of ratable value. Ratable value refers to the open market annual rental value of a business or non-residential property. The Crossrail BRS is levied annually on commercial and non-residential properties in all the 32 London Boroughs and the City of London with rateable values above £55,000 pounds ($88,000 dollars). A total number of 46,468 properties are liable to pay Crossrail BRS, with 68 percent of the properties located in Inner London. The Crossrail BRS rate is reviewed at least every five years.

Financial Performance

Overall, Crossrail BRS revenues are expected to fund £4.1 billion ($6.1 billion dollars) of the total project cost of £14.8 billion pounds ($22.6 billion dollars). Crossrail BRS revenues are being used to pay £600 million pounds ($960 million dollars) in construction costs and the interest on the £3.5 billion pounds ($5.5 billion dollars) debt borrowed by GLA to finance part of the project construction. The annual interest cost was estimated to be £210 million pounds ($330 million dollars). Upon completion of the Crossrail project, BRS revenues will also be used to pay down the principal amount borrowed. For this reason, The taxation of Crossrail BRS will last between 21 to 28 years (estimated end year - 2037).

Revenues generated by the scheme include:

- **Gross BRS revenue for 2010-2011** – £226.6 million pounds ($ 360 million dollars) [initial projection - £219 million pounds ($340 million dollars)]
- **Revenues expected over the lifetime of Crossrail BRS scheme -** £8.094 billion pounds ($ 12.8 billion dollars) in nominal value

Data Source: (Greater London Authority, 2010; Roukouni & Medda, 2012)

4. Critical Success Factors for Transit Value Capture Finance

Based on a review of the literature and case studies, the factors that are critical to the success of transit value capture finance are identified in table 11. Each critical success factor (CSF) is supported by conditions and high level guiding principles that transit agencies should consider during the implementation of transit value capture finance. The critical success factors (CSF) include:

A. *Feasibility:* Factors that influence the likelihood of a LVC mechanism, gaining the necessary approvals, support, and actions that are critical to its success as a transit value capture tool.
B. *Equity:* Factors that influence the likelihood of the utilization of a LVC mechanism generating net positive or neutral impacts on all key stakeholders – the transit agency, private entities, and the public.
C. *Efficiency*: Factors that influence the size of the financial benefits (revenues) generated relative to the financial costs (time and resources) incurred during the utilization of a LVC mechanism.
D. *Revenue Capacity:* Factors that influence the size of the financial benefits (revenues) generated by a LVC mechanism relative to transit agency's preferred LVC cost contribution towards the transit investment(s).

The transit land value capture critical success factors in table 11 were identified to: (1). Guide public transit authorities in evaluating a set of land value capture (LVC) alternatives for transit project finance; (2). Help agencies determine which instrument(s) best fits their institutional capacity and local context and fulfils their transport funding objectives (3) Lead transit agencies interested in transit value capture finance towards robust planning and successful implementation of LVC mechanisms. To this end, it is important that all four critical success factors be incorporated into business cases and economic evaluation frameworks used for assessing transit value capture finance options. A Multiple Account Evaluation (MAE) is highly recommended because one of the critical success factors (Feasibility) is qualitative in nature, while the others (Equity, Efficiency, and Revenue Capacity) are quantitative. MAE is a method of analysis that incorporates both quantitative and qualitative criteria, and evaluates a set of alternatives for each criterion (see tables 12 and 13). The MAE is practical for economic evaluation when some factors cannot be monetized (Victoria Transport Policy Institute, 2014).

Table 11. *The Transit Land Value Capture Critical Success Factors table*

Critical Success Factors	Conditions	High Level Guiding Principles for Application	Sources
Feasibility	• **Directedness** - Clear relationship between transit funding shortfall, transit investments and potential LVC revenues • **Legislative Authority** for Development, Investment, and/or Taxation • **Political Buy in and Leadership -** Political support; clear policy objectives and political direction • **Coordination** and **Cooperation** between agency and government(s): ○ Supportive Land Use and Flexible Zoning Regulation ○ Land and revenue sharing or transfers to transit agency • **Private Sector Buy in:** ○ Acceptability - Willingness of developers and land owners to pay ○ Direct benefits to private sector ○ Gross revenue sharing • **Public Acceptance and Support:** ○ Multi Stakeholder Engagement ○ Accountability and Transparency ○ Clear Case of Public Wealth Generation • **Real Estate Market Performance:** Strong Real Estate Market vs. Weak Real Estate Market • **Transit Agency and Government Capacity:** ○ Development Knowledge and/or Expertise ○ Transit Value Uplift Appraisal ○ Entrepreneurial Skills – Planners and Real Estate Experts • **Relationship with Existing Tools for Financing Urban Growth**	"Context Driven" "Project Specificity" "Collaboration" "Inclusion" "Due Diligence" "Economic Thinking" "Strategic Planning"	(George Hazel Consultancy, 2013; Hallegatte & Viguie, 2014; Ingram & Hong, 2011; Mathur & Smith, 2013; Medda, 2012; Roukouni & Medda, 2012; Rybeck, 2004; Smolka, 2013; Suzuki et al., 2015; Walters, 2012; Zhao et al., 2012; Zhao & Larson, 2011)

Critical Success Factors	Conditions	High Level Guiding Principles for Application	Sources
	• **Relationship with Local Planning and Urban Development Goals:** ○ Land Use and Urban Growth Impacts - Ability to shape land use)		

Equity	• **LVC based on Equity and Partnership:**
	  ○ Ability to Pay - Private Sector Partner and Property Owner
	  ○ Flat taxation vs. Distance to transit station based taxation (For TBLVC instruments)
	  ○ Clear, Fair, and Transparent Rules
	  ○ Risk and Cost Sharing (For DBLVC instruments)
	  ○ Benefit Sharing based on fairness and risk allocation
	• **Net Positive or Neutral External Impacts on:**
	  ○ Real Estate Development
	  ○ Urban Development Patterns
	  ○ Housing and Transportation Affordability
	• **LVC based on Public Wealth Creation**
		"Fairness"
		"Partnership"
		"Due Diligence"
		"Inclusive Value Creation"
			(George Hazel Consultancy, 2013; Huxley, 2009; Ingram & Hong, 2011; Kitchen & Lindsey, 2013; Medda & Modelewska, 2009; Medda, 2012; Roukouni & Medda, 2012; Suzuki et al., 2015; Translink, 2014; Zhao et al., 2012; Zhao & Larson, 2011)

Efficiency	• **Rate of Return -** Time required or rate at which the LVC mechanism yields revenue or financial returns • **Cost of Implementation** – Transaction and administrative costs • **Ease of Implementation -** Time required to implement the LVC mechanism	"Resource Efficiency"	(Fensham & Gleeson, 2003; Hallegatte & Viguie, 2014; Ingram & Hong, 2011; Kitchen & Lindsey, 2013; Medda & Modelewska, 2009; Medda, 2012; Roukouni & Medda, 2012; Zhao & Larson, 2011)
Revenue Capacity	• **Revenue Yield** relative to transit funding gap • **Revenue Stability** - Inflation-adjusted minimum guaranteed revenues • **Recurrence** - Number of times mechanism can be applied (For TBLVC Instruments) • **Amount of Land and Development Rights** (For DBLVC Instruments)	"Funding Objective Driven"	(Cervero & Murakami, 2008; George Hazel Consultancy, 2013; Gihring, 2009; Kitchen & Lindsey, 2013; Mathur & Smith, 2013; Medda & Modelewska, 2009; Roukouni & Medda, 2012; Suzuki et al., 2015; Zhao et al., 2012; Zhao & Larson, 2011)

Critical Success Factors	Conditions	High Level Guiding Principles for Application	Sources
	• **Size of Taxable Transit Benefiting Area** (For TBLVC Instruments)		

__Table 12.__ A Multiple Account Evaluation (MAE) for evaluating a set of alternative land value capture mechanisms using the four critical success factors – Feasibility, Equity, Efficiency, and Revenue Capacity

Accounts	Alternatives					
	Direct Property Development	Joint Property Development	Tax Increment Financing	Land Value Tax	Special Assessment Districts	Combination
Feasibility						
Equity						
Efficiency						
Revenue Capacity						
Total						
Worst ○ Poor ◔ Fair ◑ Better ◕ Best ●						

5. Transit Land Value Capture Finance Appraisal – The Monetary Efficiency Performance Evaluation Tool

The efficacy of any land value capture mechanism is critical to its success as a funding source for capital intensive transit projects, (See Efficiency and Revenue Capacity in table 11 – Transit Land Value Capture Critical Success Factors Table). Few literature on land value capture (Hong, 1998; Hui et al., 2004; Roukouni & Medda, 2012; Suzuki et al., 2015) have analyzed the financial costs of implementing land value capture mechanisms relative to the revenues they generate for transit investment. The costs of implementing land value capture mechanisms are never zero, and it is inappropriate to assume early in the process that the implementation costs of any LVC mechanism are not significant (Hong, 1998).

For transit agencies currently utilizing transit LVC mechanisms or interested in adopting them for future transit investments, tools that measure the monetary cost efficiency of LVC mechanisms in terms of revenue generation are not publicly available. To this end, a simple monetary efficiency performance ratio was used to measure the monetary efficiency of transit land value capture mechanisms using actual or projected cost and revenue figures. The ratio is called the Transit Land Value Capture Cost Recovery Ratio (TLVCCR).

5.1. Transit Land Value Capture Cost Recovery Ratio (TLVCCR)

The Transit Land Value Capture Cost Recovery Ratio simply compares the financial revenues generated from a LVC mechanism relative to the financial costs incurred in applying the mechanism for any given time period. It measures the financial benefits generated per dollar invested in implementing the mechanism.

$$\text{Transit Land Value Capture Cost Recovery Ratio} = \frac{\text{Revenues}}{\text{Transaction Costs}}$$

Where

- Revenues include: the sum of (inflation adjusted) revenues generated from the LVC mechanism for a period of time. Examples – property development related revenues; land sale revenues; land lease revenues; air rights sale revenues; financial/land contribution from land readjustment; annual revenues from special assessments districts/betterment charges; and value capture tax revenues.

- Transaction costs include: the sum of (inflation adjusted) costs incurred while using the LVC mechanism for a fixed period of time. Examples – land acquisition costs; land leasing costs; collection costs; set-up costs; other administrative costs; interest costs; and value capture tax/charge/fee exemptions.

5.2. Application of Transit Land Value Capture Cost Recovery Ratio (TLVCCRR) to Global Case Studies

The Transit Land Value Capture Cost Recovery Ratio was applied to the three case studies highlighted in the case studies section – Nanchang Railway Transit Group (NRTG) Direct Property Development, Hong Kong MTR Corporation Rail plus Property (R+P) program, and London Crossrail Business Rate Supplements (BRS). The results of their applications are presented in tables 13, 14, and 15.

Table 13. *Transit land value capture cost recovery (TLVCCR) analysis of the Nanchang Railway Transit Group (NRTG) direct property development venture for the consolidated 2012-2015 period*

2012-2015 NRTG Total Property Development Revenues (EBITDA)	**Total Transaction Costs**	**TLVC Cost Recovery Ratio**	**TLVC Cost Recovery Ratio (%)**
$2,272,000,000	$1,100,000,000	2.07	207%
***EBITDA – Earnings before Interest, Taxes, Depreciation, and Amortization**			
Financial Data Source: (Suzuki et al., 2015)			

Table 13 shows that the Nanchang Railway Transit Group (NRTG) is an efficient LVC venture as it achieves full cost recovery and revenue generation. A cost recovery ratio of 2.07 (207%) is estimated, which means that for every dollar spent on direct property development ventures 1.07 dollars of revenues was also generated for transit investment.

Table 14. *Transit land value capture cost recovery analysis (TLVCCR) of Hong Kong MTR R+P for years 2013 and 2014*

MTR Rail and Property Revenue Streams	2013 Revenues (EBITDA)	2013 Transaction Costs	TLVC Cost Recovery Ratio	TLVC Cost Recovery Ratio (%)	2014 Revenues (EBITDA)	2014 Transaction Costs	TLVC Cost Recovery Ratio	TLVC Cost Recovery Ratio (%)
Station Commercial Business	$591,700,000	$56,456,000	10.48	1048%	$640,000,000	$66,410,000	9.64	964%
Property Rental and Management	$487,245,000	$85,764,000	5.68	568%	$540,308,000	$96,327,000	5.61	561%
Property Development	$180,041,000	$10,189,000	17.67	1767%	$543,662,000	$2,837,000	191.64	19164%
Total	**$1,259,000,000**	**$152,409,000**	**8.26**	**826%**	**$1,723,959,000**	**$165,574,000**	**10.41**	**1041%**
***EBITDA – Earnings before Interest, Taxes, Depreciation, and Amortization**								
Financial Data Source: (MTR Corporation, 2015)								

Similarly, the Hong Kong MTR Rail plus Property program recorded a TLVCCR of 8.26 (826%) and 10.41 (1041%) in 2013 and 2014 respectively. In monetary terms, this means that in 2013, revenues of $726 dollars were generated per dollar spent implementing the R+P program, while in 2014, revenues of $941 were generated per dollar spent. Property development recorded the highest cost recovery in 2013 and 2014 compared to all other R+P revenue sources, owing to its low transaction costs but significantly high revenues (see table 14). Low transaction cost could be explained by MTR's joint development approach to property development on its excess land assets, where development related costs and risks are transferred entirely to private developers in exchange for sharing development profits from property sale and lease upon project completion (Suzuki et al., 2015).

__Table 15.__ Transit land value capture cost recovery (TLVCCR) analysis of the London Crossrail BRS scheme for 2011-2012 period using modified BRS revenues estimated by Roukoni & Medda (2012)

2011-2012 Estimated Total Crossrail BRS Collectable – Inner and Outer London	2011-2012 Estimated Total Transaction Costs – Collection Costs and Set up Costs	TLVC Cost Recovery Ratio	TLVC Cost Recovery Ratio (%)
$308,619,000	$3,988,000	77.4	7740%
Financial Data Source: (Roukouni & Medda, 2012)			

The estimated cost recovery ratio for Crossrail Business Rate Supplements (BRS) is 77.4 (7740%), which is the highest cost recovery ratio of all the three case studies (see table 15). It has the lowest cost of implementation (collection and set up cost) relative to its revenue yield. NRTG's property development venture has the highest implementation cost (see table 16). This is expected of a direct property development LVC mechanism where the transit agency takes full responsibility for land acquisition costs and development (construction) costs.

__Table 16.__ Summarized table of transit land value capture cost recovery rates (TLVCCR) for the Nanchang Railway Transit Group (NRTG) direct property development venture (2012-2015), Hong Kong MTR R+P program (2013 and 2014), and London Crossrail BRS scheme (2011-2012)

Case Study	Type of LVC	Total Annual Transaction Cost	Total Annual Revenues	TLVC Cost Recovery Ratio	TLVC Cost Recovery Ratio (%)
NTRG Direct Property Development	DBLVC	$1,100,000,000	$2,272,000,000	2.07	207%
Hong Kong MTR R+P	DBLVC	$165,574,000	$1,723,959,000	10.41	1041%
London Crossrail BRS	TBLVC	$3,988,000	$308,619,000	77.4	7740%

6. Monetary Analysis of Transit Land Value Capture Mechanisms: Limitations and Opportunities

The Transit Land Value Capture Cost Recovery Ratio (TLVCCR) tool adequately compares costs and revenues, but is unable to calculate the rate of financial return (cash flow generation) that is required for a LVC mechanism to generate revenue to recover implementation costs and meet a transit funding contribution objective for a given period of time. A financial rate of return tool is thus required in the LVC analysis toolkit. Alternatively, entities interested in conducting LVC analysis (transit agencies, banks, governments, financiers, etc.) could conduct a standard internal rate of return (IRR) analysis to determine the profitability of an LVC venture being considered for transit finance.

The analysis of LVC mechanisms can be difficult to conduct with insufficient financial data or the lack there of. The lack of longitudinal public financial data on LVC implementation – particularly financial costs was an impediment to the development of the monetary analysis section of this report. More specifically, the TLVCCR could have been applied over longer periods and to more global case studies if sufficient LVC data were made publicly available. Going forward agencies and governments involved in transit value capture finance should considered the following actions to improve data availability for sound global research and analysis, and decision making in transit value capture finance:

- Create, release, and catalogue annual financial reports for transit agencies online. A good example is the Hong Kong MTR Corporation annual financial audit reports that are publicly available.
- Alternatively, conduct annual assessments of LVC programs and publish financial data and assessment results in reports available online.

7. Conclusion

Overall, Land Value Capture finance is rapidly acquiring global legitimacy as an ancillary and innovative source of funding for expensive urban transport projects. The highlighted economic impacts of public transit investments on surrounding properties make a strong case for transit value capture finance in cities. However, Development Based Land Value Capture type mechanisms have unique advantages over Taxation Based Land Value Capture type mechanisms and vice versa. The advantages of Development Based Land Value Capture include: (1) High revenue potential;

(2) Low political risk; (3) Partnership and Financial Benefits Sharing. In contrast, the advantages of Taxation Based Land Value Capture include: (1) Low financial cost of implementation; (2) Low financial risk associated with implementation; (3) Recurrence – TBLVC instruments can be applied multiple times over a long period of time (up to 30 years – See London Crossrail Case Study) to transit benefitting properties in order to generate significant revenues to be put towards transit project funding.

It is critical that city leaders and transit executives consider the unique advantages of the two types of LVC to ascertain which best fits their local context and funding objective. Alternatively, DBLVC and TBLVC mechanisms can be consolidated to meet a funding objective, while leveraging the strengths of each type. Feasibility, Equity, Efficiency, and Revenue Capacity and their supporting criteria must be adhered to maximize the utility of any type of LVC mechanism for transit finance. Efficiency and Revenue Capacity especially underscore the essence of evaluating the revenues LVC mechanisms relative to their costs. The Transit Land Value Capture Cost Recovery Rate (TLVCCRR) – although inadequate – presents transit agencies and governments with a simple metric to measure the financial costs of LVC mechanisms compared to their financial benefits. This is a critical step towards thinking more economically about LVC finance tools used for financing transit and sustainable urban development.

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