VALUE CREATION? VALUE CAPTURE? AN ASSESSMENT OF THREE DIFFERENT TYPES OF TRANSPORT INTERCHANGES

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ABSTRACT

This paper examines firstly, how to measure the extent of value created as a result of the provision of transport infrastructure and secondly, outlines the applicability of the use of global value capture mechanisms in the South African context.

Three case studies were used to undertake the above assessment. The case-studies included a proposed Bus Rapid Transit interchange in Soweto, a proposed Metrorail station in Khayelitsha, Cape Town and an interchange on the proposed PWV9 Highway near Diepsloot, Johannesburg.

The paper outlines an alternative method to measuring the extent of value creation that is based on a forward-looking, feasibility approach rather than the historic, hedonic approach that is conventionally used.

Through this method, the paper shows that the extent of value creation is likely to be dependent on the type of interchange developed and the context in which the development of the interchange takes place.

Taking the South African institutional and legal context into account, and through an analysis of internationally used value-capture mechanisms, the paper suggests that only a number of these recognised mechanisms will be able to be used to capture the value at these particular interchanges.

1   INTRODUCTION

The National Treasury has allocated significant funds for transport related infrastructure development between 2004 and 2011 and further allocations are likely to occur (Brown-Luthango 2011). This expenditure is increasingly seen to lead to value-creation and value-capture opportunities, which in turn, can generate funding and developmental possibilities.

Using the residual valuation approach applied in the Urban LandMark commissioned African Development Economic Consultants (ADEC) report, this paper seeks to firstly, apply a residual valuation approach to identify if, and under what circumstances, value is created as a result of transport infrastructure development, and to secondly, identify what potential mechanisms can be used in the South African context to capture such value.

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The term "value" is used broadly to refer to financial value as well as value relating to the achievement of planning or developmental objectives such as densification or inclusionary housing.

"Value-capture" is a term used to describe the process of extracting (in different ways) the additional value that accrues to a property as a result of some public investment such as the provision of public transport or a school. It is the extraction of the value over and above the value that the property would have if the public investment had not taken place. It is usually argued that as the additional value is created as a result of the state action and not that of the owner, it is justifiable for the state to lay claim to this value through a variety of mechanisms (Rodriguez and Mojica, 2008).

The paper is based primarily on research commissioned by Urban LandMark and undertaken by African Development Economic Consultants (ADEC). Urban LandMark is a DFID-sponsored NGO that seeks to make markets work better for the poor and looks to identify ways to make well located sites more accessible to the poor. Land values in and around well located locations are generally by definition high and as a result lower income households and business enterprises tend to be excluded from these sites. However, with the rollout of new and extended transport infrastructure, additional well located sites can be created. Urban LandMark therefore wished to investigate the economics of value-creation and value-capture and to identify whether it is possible to "get ahead of the curve" in securing these sites for more socially-orientated development.

Drawing on the literature, the paper begins by firstly assessing what evidence there is that the provision of transport infrastructure increases the value of surrounding properties and secondly, outlines the dominant method used to determine this value increase. Following this, the paper introduces the residual valuation method that was used to determine the extent of value that could be created as a result of the development of three types of transport infrastructure, namely, a BRT stop in Soweto, Johannesburg, a Metrorail station in Khayelitsha, Cape Town and a highway interchange near Diepsloot, Johannesburg. An overview of the three case-studies is then given and the results of the value calculation presented. The subsequent section suggests some key lessons as to how and when value creation can be maximised as a result of transport infrastructure investment and finally, the paper will outline what mechanisms could potentially be used in the South African context to capture such value for financing and other developmental objectives.

2   A BRIEF OVERVIEW OF THE LITERATURE

Numerous studies to date have been undertaken to try and assess the degree to which the provision of transport infrastructure increases the neighbouring property values. These studies have focussed on North America and Europe but have more recently been complimented by studies in South America and Asia (Smith et al, 2006). The findings of these studies have varied considerably. While generally there does appear to be a positive correlation between transport infrastructure provision and the value of the adjacent properties, studies have shown that in some cases there is either no correlation or that there is a negative correlation as a result of the negative externalities (noise, pollution, crime etc.) generated by the infrastructure (Rodriquez and Targa, 2004; Rodriguez and Mojica, 2008; Du and Mulley, 2007; Debrezion et al, 2007).

These differences in the findings can be partially explained by the fact that the impact that transport infrastructure has on adjacent property values differs by transport infrastructure type and the development context in which it occurs (RICS, 2002; Debrezion et al, 2007).

However, Debrezion et al (2007) argue that the differences can also be explained by the fact that different methods have been used in the research. Furthermore, even when similar methods have been used such as the hedonic pricing models, differences still occur because different input variables are used in the models. The hedonic pricing method is a technique that attempts to isolate how much a change in one variable can be explained by the change in another variable. "It is based on the assumption that people value the characteristics of a good, or service it provides, rather than the good itself. Thus, prices will reflect the value of a set of characteristics...." (RICS, 2002,1). For example, the method will try to explain what percentage of a property's value is due to its proximity to a transport interchange. However, as Cervero and Susatono (1999,12) state, "Part of the difficulty lies in the shortage of empirical evidence demonstrating that accessibility gains get meaningfully capitalised into property values and rents." Furthermore, as Cervero and Wu and Burnley et al argue, other factors such as stage of life-cycle, tenure options and housing affordability increasingly shape household location decisions (RICS, 2002).

Even though it has been a commonly used method[1] to determine property value differentials around transport infrastructure, the hedonic pricing method has a number of short-comings including the ability to identify the value-generating characteristics of a property, the need for time-series data over three different time periods, the ability to factor in the time taken for the impact of the infrastructure on value to be realised, the need for there to be sufficient property transaction data and the statistical challenges of holding other influencing variables constant (RICS, 2002;Cervero and Susantono, 1999; Debrezion et al, 2007; Grimley 2004). It is also important to note that the impact of the infrastructure may change over time as the impact may take time to take effect and may change as accessibility patterns and technology change (Debrezion et al, 2007).

3 DEVELOPING A METHODLOGY TO DETERMINE THE EXTENT OF VALUECREATION AS A RESULT OF TRANSPORT INFRASTRUCTURE DEVELOPMENT

Besides the shortcomings mentioned above, the hedonic method is limited in that it is retrospective by nature which reduces the ability of practitioners and public officials to intervene in the value-creation and value capture process. In other words, one determines the extent of the value creation after the fact by which time market and institutional forces may make it difficult for one to intervene and benefit from the value creation process.

As a result, an alternative "residual valuation" methodology was used to calculate the potential value that could be created by the three different types of transport interchanges. The residual valuation method works on the premise that ceteris paribus a developer will only pay an amount for a parcel of land that is equivalent to the total income received from a development less the costs and required profits to undertake such a development. If a greater sum is paid, the developer's required return will be reduced and the development will no longer be deemed feasible, resulting in the developer not purchasing the parcel of land (Appraisal Institute 2008).
The following simplified example illustrates the point.Assume a developer wishes to purchase a 10 hectare piece of land adjacent to a transport interchange in order to develop 200 housing units. Assume the houses can be sold for R650 000 each and that

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[1] A recent analysis by Lightstone of the impact of the Gautrain on surrounding property values is an example where such a methodology has been applied locally (Lightstone 2010).

each will cost R500 000 to construct (excluding the cost of the land). Furthermore, assume that in order to be compensated for the risks involved, the developer requires a 20% profit on the development. The resulting residual land valuation calculation will be as follows:

Selling price (per unit):   R650 000
All inclusive development cost (per unit):   R500 000
Profit (per unit):   <u>R100 000</u>
<u>Residual</u> amount left to pay for the land (per unit):   R50 000

R50 000 x 200 (units) = R10 000 000

Therefore, the developer would only be prepared to pay R10 000 000 for the 10 hectare site because if he/she paid more, the profits would be reduced and the developer would not be adequately compensated for the risks involved. Similarly, the seller of the land would not sell the land for less than R10 000 000 because assuming there is an efficient market, another developer would be prepared to pay R10 000 000 for the site should the first developer choose not to purchase the site for this amount. As a result, the equilibrium market value of the site is R10 000 000.

It is important to note however that it is not a given that infrastructure investment will automatically result in an increase in adjacent property values. If for example, a transport interchange produces negative externalities relating to say crime and grime, the demand for uses on the surrounding properties may decrease, leading to lower rentals and selling prices, which in turn will result in lower residual land values.

The main advantage of the residual valuation method is that one is able to calculate the likely value creation (or opposite) that may result <u>prior</u> to the infrastructure investment taking place. This in turn, allows one to firstly design and develop the infrastructure and surrounding land development in a manner that maximises this value creation. Secondly, it allows one to secure control of the adjacent land holdings so that one can benefit from the value-capture that may occur.

Notwithstanding the above, the residual valuation method does have some shortcomings in that any change to the input variables such as income received, development costs and required profit levels, may result in significant changes to the residual value. Therefore, if the input data is not available, poor and incorrect assumptions are made, the resultant residual value can be notably inaccurate (Appraisal Institute 2008).

4 APPLICATION OF THE RESIDUAL VALUATION METHOD TO THREE TRANSPORT INFRASTRUCTURE CASE-STUDIES

The above methodology was applied to three transport infrastructure case-studies, namely Mooki Street BRT stop in Soweto, Kuyasa Metrorail station in Khayelitsha, Cape Town and the proposed PWV9 interchange near Diepsloot, Johannesburg.

The case studies were chosen such that there was a diversity of transport infrastructure types, a geographical spread, the infrastructure was new, the infrastructure was likely to be replicated and there were comparable non-interchange sites near-by.

The application of the methodology firstly involved undertaking an analysis of each site in terms of its history, size, location, layout, infrastructure provision, existing and future

developments, demographics and current land-uses. Following this, a market analysis, based on the availability of land, infrastructure, development rights and market demand, was done to determine the type and scale of development (highest and best use) that each site could support. Based on these development scenarios, residual calculations were then undertaken to determine the additional surrounding land value that was generated as a result of the transport infrastructure investment.

With respect to the Mooki Street site, the market analysis forecast a potential for 811 residential units and 7000m² of retail space. Table 1 shows a summary of the residual valuation calculation that was undertaken. The calculation shows that the average market price of the land with the transport interchange was approximately R600/m².

Table 1: Mooki Street Interchange Residual Land Calculation

	Flats to Lease	Flats for Sale	Single Residential	Retail
Income	R144 130 000	R68 237 500	R271 600 000	R52 056 000
Costs	R108 828 770	R61 982 875	R245 443 000	R49 456 789
Land Residual Value	R35 301 230	R6 254 625	R26 157 000	R2 599 211
Rate per m²	R581	R422	R425	R969

(ADEC 2010)

An assessment of the Chris Hani Rail Station forecast a potential for 2500 residential units and 19,000m² of retail space. Table 2 shows a summary of the residual calculation that was undertaken. The calculation shows that the average market price of the land with the transport interchange was approximately R394/m².

Table 2: Chris Hani Interchange Residual Land Calculation

	Flats to Lease	Flats for Sale	Single Residential	Retail
Income	R410 120 000	R216 000 000	R637 000 000	R140 442 000
Costs	R379 704 650	R207 200 000	R604 787 000	R134 240 003
Land Residual Value	R30 415 650	R8 800 000	R32 213 000	R6 201 997
Rate per m²	R255	R241	R230	R852

(ADEC 2010)

Lastly, an analysis of the Diepsloot Highway Interchange forecast a potential for 43 000m² of retail space, 33 000m² of office space and 75 000m² of industrial space. Table 3 shows a summary of the residual calculation that was undertaken. The calculation shows that the average market price of the land with the transport interchange was approximately R2 200/m².

Table 3: Diepsloot Interchange Residual Land Calculation

	Retail	Office	Industrial
Income	R424 750 000	R316 807 000	R542 567 000
Costs	R368 143 218	R285 271 478	R448 853 915
Land Residual Value	R56 606 782	R31 535 522	R93 713 085
Rate per m²	R2 725	R2 580	R1 424

(ADEC 2010)

These rates were then compared against actual, existing land values in these locations (without the interchanges being built).

However, in order to verify these differentials, two further land value comparisons were undertaken. Firstly, residual calculations were undertaken for a scenario where the interchange was built (as above) and for a scenario where the interchange was not built. In other words, comparisons were made of the residual land values based on scenarios where the development of the surrounding land proceeded with and without the interchanges being built.

It should be noted that the scale, type, and pricing of development (in other words, demand) may be different at a particular site depending on whether the interchange is constructed or not and hence the basis for the residual calculations will differ accordingly. Theoretically there should not be a difference between the current land market value and the residual value calculated for a non interchange scenario. However, due to market inefficiencies, this will not always be the case.

Secondly, the residual values determined with the interchanges in place were compared with values at comparable sites where there is zoning and services in place to accommodate such development but where no interchange exists. Due to the fact that multiple variables have to be considered, weighted averages were compiled from sites throughout the region of each site with similar characteristics.

Table 4 summarises the three different comparative methods used.

Table 4: Summary of Methods Used

Method 1		Method 2		Method 3	
Compare Values		Compare Values		Compare Values	
Value of surrounding land with interchange and surrounding land developed	Value of surrounding land with no interchange and surrounding land **not** developed (as is scenario)	Value of surrounding land with interchange and surrounding land developed	Value of surrounding land with surrounding land developed **but no** interchange	Value of surrounding land with interchange and surrounding land developed	Value of land surrounding other sites that have similar characteristics in terms of zoning and development potential but no interchange

Tables 5, 6 and 7 show the differentials calculated using the different comparison methods.

Table 5: Value Differentials (Method 1)

	Current Land Values per m²	Residual Land Values with Interchange Built	Differential
Mooki Street	R422	R600	1.42
Chris Hani	R200	R394	1.97
Diepsloot	R120	R2 200	18.30

(ADEC 2010)

Table 6: Comparison with Residual Calculations (Method 2)

	Residual Land Values without Interchange Built	Residual Land Values with Interchange Built	Differential
Mooki Street	R477	R600	1.26
Chris Hani	R180	R394	2.19
Diepsloot	R800	R2 200	2.80

(ADEC 2010)

Table 7: Comparison with Similar Interchange Sites (Method 3)

	Current Land Values per m²	Residual Land Values with Interchange Built	Differential
Mooki Street	R492	R600	1.22
Chris Hani	R224	R394	1.76
Diepsloot	R1 120	R2 200	1.96

(ADEC 2010)

Reviewing the above, there is a danger of concluding that a railway interchange will generate a higher land values than a BRT stop, and that a highway interchange will have an even higher impact on land values than a rail interchange. While there may be some logic in this, since rail and (limited access) highways have fewer entry points and thus a near monopoly on access to rapid transport, the ADEC report cautions against, "...drawing such conclusions without further research, since a multitude of variables can account for the differences between transport modalities and locations" (2010:34). A far greater number of cases need to be analysed before one will be able to generalise about the impacts of certain interchange types.

5   GENERAL OBSERVATIONS WITH RESPECT TO VALUE CREATION

As value is generally a function of income, it is important that the provision of infrastructure changes the level of spend in the particular location. In other words, if the provision of infrastructure does not change the level of income that an area can attract and capture, then by definition, additional value is unlikely to be generated. If for an example the upgrading of a rail station does not alter the number of commuters passing through the station, or the level of spend of the commuters in the adjacent area, or the number of commuters wanting to live near to the station, then the level of value add as a result of the station upgrade is likely to be low. In summary, increased spend results in greater demand for space in the area, which results in higher rentals and higher price being paid, which in turn results in higher residual land values. It is these higher property prices and land values that can potentially be captured to pay for the transport infrastructure or be used to cross-subsidise socially-orientated developments.

While changing the level of spend is a necessity for value creation, it may not be sufficient on its own. It is also very important that favourable development conditions exist adjacent to the interchanges. If poor development conditions exist it is unlikely that the value creation potential resulting from the infrastructure provision will be realised and maximised. Poor conditions exist when there is a limited availability of land, land ownership patterns are complex, there are poor levels of infrastructure, poor urban management prevails and development rights are lacking or are difficult to obtain. This is therefore an area where the public authorities can intervene meaningfully to maximise value creation.

6   VALUE CAPTURE MECHANISMS

The USA, Europe and more recently South America and Asia have developed a number of mechanisms to "capture" the value that is generated as a result of infrastructure provision. Broadly, these mechanisms fall into two categories, with the one containing those mechanisms that look to capture the value in the form of income to pay for the transport and other urban infrastructure, while the other contains those mechanisms that use the value add to facilitate broader planning outcomes such as densification and inclusionary housing. The remainder of the paper outlines some of the main mechanisms used to date.

6.1   Transit-Oriented Development

Transit-oriented development (TOD policies typically make use of public rail-based mass transit to leverage mixed-use private and institutional development. In TOD, property development is oriented to, and maximised at, public transit nodes. TOD not only helps alleviate issues related to sprawl and low densities, but can also dramatically increase ridership and utilisation of public transport. TOD puts more housing and jobs, and thus more potential commuters, within walking distance of a transport interchange and in doing so, can help establish a captured "market" for public transport and increase revenue streams accordingly (ADEC 2010).

6.2   Zoning Tools

Zoning can be used to direct the location, type, and scale of development as long as there is the market demand to support the envisioned type and scale of uses. Incentive zoning rewards developers for providing certain public amenities or meeting public objectives. Floor-area bonuses are an example of such an incentive, which allows a developer to build greater floor areas in exchange for the provision of specified public amenities. These bonuses make the provision of public goods by the developer viable because the higher densities generate a higher return by reducing the marginal cost of development. However, it is important that such zoning polices be flexible and responsive to market conditions. If there is no market demand for the greater floor area, limited surplus funds will be generated to cross subsidise the provision of public goods. Simply zoning land for higher densities will not ensure that higher-density development actually occurs (ADEC 2010).

"Inclusionary zoning" is a variation of such a tool that is becoming increasingly popular in the USA and UK. Local authorities require developers to include a certain percentage of affordable units in their projects to create mixed-income communities. As the ADEC report states, "Inclusionary zoning is particularly relevant and successful in high-density and transit-oriented development (TOD) projects, because the densities, mix of uses, and broad market appeal, allow developers opportunities for cross-subsidisation. Thus, the value created at a transit node allows developers the financial leverage to create affordable housing and inclusionary zoning requires it of them" (2010:17).

6.3   Land Banking

Land banking usually involves local governments acquiring land near transport interchanges and holding it until some future date where it is either developed, sold or leased. Value may accrue to the local authorities through either income generated through leasing or sale of the property or through the attainment of some developmental objective such as the provision of social housing (ADEC 2010). Land banking is likely to be

successful when the market conditions foster value appreciation and where such appreciation off-sets the opportunity cost of acquiring and holding such land. As a result, a sophisticated understanding and knowledge of the property market is required by the relevant authorities.

6.4 Betterment Tax or Special Assessment

Betterment taxes are generally imposed by local governments to capture the increase in land value generated by private development that results from investment in infrastructure (including transport infrastructure). These taxes usually oblige owners and occupants to pay for a public service. Betterment taxes are most effective in growing property markets where there are effective taxation and valuation systems in place. Affluent communities often show a stronger willingness to pay, which can result in the concentration of infrastructure interventions in wealthier neighbourhoods. Political and community resistance often prevents such taxes from being used elsewhere (ADEC, 2010).

6.5 Business Improvement Districts

A City Improvement District (CID) in South Africa involves the imposition of an additional tax or levy on property owners and/or businesses located within a specific area. The funds raised through this tax pay for an additional layer of municipal service such as cleaning and security as well as infrastructure improvements, signage, landscaping, surveillance cameras, marketing, management, and other services that benefit the property owners, businesses, and residents of the designated area. To date, CIDs in South Africa have generally not been associated with transport infrastructure development but this is may change in the future (ADEC 2010).

6.6 Development Impact Fees

Developer contributions are once-off payments made by developers to local authorities to help recover the cost of public infrastructure required to accommodate the new developments. Developers are often required to pay for infrastructure beyond their own site boundaries, when such development causes impacts on regional (bulk) infrastructure systems (ADEC, 2010). Such contributions are usually made on a pro-rata basis and the resultant infrastructure provision can often help lever or stimulate additional development in an area. Such mechanisms are used locally but recent work by Savage (2009) suggests that these mechanisms have been used in an ad hoc and unsatisfactory manner in South Africa.

6.7 Joint Development Agreements

Joint Development Agreements are public-private partnerships where both parties contribute to the costs of a transport facility and share in any income generated from any development resulting from the provision of the facility. Joint development projects are often location-specific and have a high degree of community involvement and complexity (ADEC 2010).

6.8   Land Value Increment Taxes

This is a variation on conventional property taxation systems and is a mechanism to capture value at specific locations by ring-fencing the revenue raised on the incremental increase in the value of land brought about by public interventions (ADEC 2010). This is similar to a Betterment Tax, however a Betterment Tax is often a once off payment and can be in the form of a direct provision of some public infrastructure, whereas the Land Value Increment Tax is often an on-going collection.

6.9   Air Rights

Air rights facilitate the development above public infrastructure such as railway stations and highways. In South Africa, air rights have allowed for the development of The Bridge Shopping Centre above the railway lines near Johannesburg Park Station and N1 Plaza (built above the N1 Highway in Midrand). In some cases, air rights have been granted by public authorities in return for the provision of public amenities, infrastructure and affordable housing (ADEC 2010).

6.10 Tax Increment Financing (TIF)

In this case the additional or "incremental" taxation that is generated as a result of the increased property value occurring as a consequence of public infrastructure provision is "ring-fenced" and used to service the municipal bonds issued to pay for the infrastructure within that precinct. In short, municipal governments finance improvements based on the future incremental revenue stream generated as a result of the private development. Clearly, a very sound understanding of the market is required because the cost of finance and the ability to service the bonds are directly related to the development's viability (ADEC 2010).

7   GENERAL OBSERVATIONS WITH RESPECT TO VALUE CAPTURE MECHANISMS

The above examples of value capture mechanisms suggest that there are three important conditions of success. The first is that policy objectives must be clear and non contradictory. As such, a local authority should not attempt to satisfy too many policy objectives in one development. For example, if the objective is to generate the maximum level of income to finance the provision of the transport infrastructure, the project should not be ham-strung with too many socially-orientated conditions such as the provision of high levels of social housing.

The second is that value capture mechanisms are only likely to be successful if the market conditions are conducive to the creation of surplus value over and above that needed to make the development viable. As a result, a degree of flexibility and a sound understanding of the market forces and conditions are required by all parties involved.

Lastly, many of the mechanisms require the establishment of public private partnerships and the ability to "ring-fence" revenue around specific developments and locations. As a result, the necessary institutional systems and legal frameworks need to be in place to permit and facilitate such activities. Further research is required to assess whether South Africa's institutions and legislation are structured appropriately in this regard to maximise the benefits of value creation and capture through the provision of public transport infrastructure.

8   CONCLUSION

This paper has applied the residual valuation method to three transport interchange case-studies to show the degree that additional land value can be created as a result of the provision of transport infrastructure. Drawing from these case-study findings, the paper has however suggested that while the provision of the infrastructure is a necessity, it is not sufficient in and of itself, to generate the potential additional value. In order for the value to be created, the infrastructure must increase the expenditure in the area and conducive development conditions in the form of land, development rights, ownership patterns and infrastructure provision must be present if the value creation is to be realised.

The paper has also outlined some internationally recognised mechanisms that are, and could be, used to capture the additional value generated at particular interchanges. It was however argued that the degree to which these mechanisms could be successfully applied to the South African context will depend on there being sound policy alignment, a good understanding of the property market and the necessary institutional and legal systems being in place.

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