

DEVELOPING A METHODOLOGY TO CAPTURE LAND VALUE UPLIFT AROUND TRANSPORT FACILITIES

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1. INTRODUCTION

1.1 Background

In August 2003 the Development Department of the Scottish Executive appointed a consortium led by GVA Grimley to develop a methodology to capture land value uplift around transportation facilities. The consultancy team consisted of GVA Grimley, David Simmonds Consultancy, Hargest and Wallace and The Bartlett School of Planning at UCL.

The study was undertaken against a back-cloth of renewed debate over the issue of value capture and examining alternative mechanisms by which transport schemes could be supported financially.

A key objective of the research was to provide objective advice that could assist policy-makers in developing ideas and plans in relation to transport funding. This has involved developing approaches to forecasting and measuring land value change due to transportation factors, as well as identifying and reviewing various mechanisms by which land value change can be 'captured'.

1.2 Research Approach

The research was broken-down into four distinct, but inter-related, stages. These are as follows:

- Stage 1: Inception and Literature Review
- Stage 2: Development of Land Value Measurement Method
- Stage 3: Assessment of Funding Methods
- Stage 4: Reporting and Policy Analysis

In broad terms this structure was followed during the project, although there were certain modifications required as the research developed. In particular, the development of the land value measurement work required longer than planned for, due to discussions over the precise focus of investigations and data assembly issues. This involved several stages of refinement to the value measurement method, and subsequent dialogue with the Scottish Executive.

In addition, the focus of the funding method assessment was extended to cover a partial application to actual case study transport schemes. This was felt to make the results more 'concrete'. However, there were difficulties in obtaining appropriate case studies to test the funding methods on.

This paper focuses upon the assessment of 'alternative' funding methods. The other aspects of the research are touched upon briefly, but reference to the main report produced as part of the research should be made for more details.

It should be noted that detailed data collection - either as part of the land value measurement method or the case study application of funding methods - was not part of the remit of this project. The focus was upon developing a **methodology** by which such testing and application could be made.

2. EXPERIENCE FROM OTHER STUDIES

As part of the research, a critical review of relevant literature was carried out. The findings from the literature review were used to refine the survey method, particularly in relation to developing the land value measurement method. The key results from the review are contained in Appendix 1.

It should be recognised, however, that the topic of land value and transport infrastructure is considerable, and in consequence the literature is extensive. A pragmatic approach therefore needed to be used, which balanced relevance and robustness with timescale constraints and interrogation criteria.

The review of studies and the literature has, in summary, demonstrated that the expected effect on both the residential and commercial property markets appears to be positive, but the range of impacts is very variable along the route, both in scale of impact and in the location of impact. However, some of this uplift may be due to the optimism of the markets rather than actual effects. Where possible, it is important to use transactional data rather than valuation data.

A further point relates to how the location of a transport scheme can influence potential land value gains. Empirical data for this is limited, and much depends upon scheme specific circumstances. Thus, transport schemes in urban areas may normally have the greatest potential for improving land values overall. However, a transport scheme opening up 'greenfield' locations to development - assuming this is supported by planning policies - can generate a considerable rise in relative and overall land values.

To develop a robust methodology for measuring land value requires commentary on the contextual situation, an appreciation of the data requirements and limitations, a clear understanding of the issues relating to attribution, and some means by which the numerical results can be interpreted. This suggests a mixed quantitative and qualitative approach is required, as discussed briefly below.

3. THE LAND VALUE MEASUREMENT METHOD

A workable methodology was developed to assess potential land value change associated with transport infrastructure schemes. This was based upon a combination of literature review, the testing of a draft methodology at Croydon, and an examination of potential data sources and issues in Scotland. The resulting method, which is based upon a three stage process, has been termed T-IMPROVE (Transport-Investment and Measurement of PROperty Value Enhancement). A fuller explanation of the method is contained in Appendix 2.

T-IMPROVE is a method designed to quantify the scale of change in land value arising out of a transport investment at the very local level using individual property and land value transaction data. Its purpose is to understand the complexity of the linkages between transport investment and property markets, so that the transport related factors can be isolated from all other factors (e.g. economic and housing cycles, inward investment, local economic factors etc.).

It is likely that hedonic pricing (HP) or geographically weighted regression (GWR) methods would be used, with the team favouring GWR as there are less requirements in this method for primary data collection. In addition to the local scale issues, time is also important as the property market effects occur over a period of time, hence the recommendation that data are analysed at four points in time.

T-IMPROVE was tested at a strategic level at the following potential transport schemes in Scotland: the Waverley Line; the A77/M77 road link, Glasgow airport rail link, and South East Edinburgh LRT. This was to assess the potential availability of data to enable the T-IMPROVE to be carried out, rather than a detailed application of the method.

This strategic testing demonstrated that the potential exists to apply T-IMPROVE in a Scottish context, although the data collection exercise itself needs to be recognised as potentially significant. The strategic testing indicated that the necessary quantitative and qualitative data is available to carry out appropriate and meaningful analysis, as are the systems for accessing the various data. Relevant agents and agencies are also relatively clearly identifiable, and likely to be amenable to inclusion in the evaluation process. There are also various useful methodological issues raised by each of the case studies that can help in the further development of T-IMPROVE.

A more detailed testing of the T-IMPROVE methodology should be directed at all locations along the route of a proposed transport investment where an impact on the property and land markets is likely to take place, and these changes would be linked to changes in accessibility. It should be noted, however, that T-IMPROVE is not a strategic method itself, but a micro analytical approach that examines changes immediately around the stations, and links those results to cover the whole corridor along which the transport investment runs. It is directed at individual schemes and not areas as a whole.

T-IMPROVE is an empirically-based measurement method, and the practical testing of the method noted above, will help develop a database to support decision-making on a number of themes. However, a predictive approach would be needed in order to apply land value capture methods, as these capture methods need to have information on expected value changes as a basis for determining the level of funding they could generate.

A key conclusion from the research was that it is not possible to use existing land use transport interaction (LUTI) models as a basis for developing a predictive approach to land value change, mainly because the zones they represent are too coarse for the purpose. However, there are a number of options for developing

this capability, as well as possibilities for the enhancement of the proposed T-IMPROVE method. These can be summarised as follows, and follow a natural progression:

- A strategic testing of selected LUTI models in the appraisal of land value capture proposals.
- A major enhancement of existing LUTI models to enable the inclusion of land value capture processes, and hence to forecast the impact on development and land-use of the land value capture itself.
- The application of selected LUTI model (e.g. TELMoS) alongside the T-IMPROVE methodology.

4. REVIEW OF ALTERNATIVE FUNDING METHODS

4.1 Introduction

The previous section has briefly outlined the process by which land value changes can be measured, using the T-IMPROVE method. This section therefore discusses the suitability of various mechanisms by which such land value changes can be captured.

4.2 Context

In considering alternative funding methods for transport schemes based upon changes in land values, it is important to note the contributions made to transport funding from existing value capture mechanisms. This is important because it reflects the notion that a share of any increase in land value is already captured for the 'public good'.

There may be debate about the extent to which this value capture is used to support transport schemes, and the degree to which it reflects accurately value enhancements due to particular transport improvements, but it is necessary to recognise that some value increment is already captured by government. This means that any new or additional funding method based upon land value change needs to build from this base. In simplistic terms, therefore, such alternative funding methods can either be directed towards reforming existing funding methods or should be used to capture a proportion of value increase recognising the amount already captured using existing methods.

There are five broad areas in which funding is currently generated by government – in various forms – through property charges or taxes. These are listed in Table 4.1, along with the existing levels of net funding they generate at the UK level (based on 2000/01 data). These findings are applicable to Scotland, although the proportions of funding may well be different between the different existing funding sources.

Table 4.1: Funding Levels from existing funding methods

Funding Source	Revenues (Net - £ billion per annum)
Rateable value	18.5
Stamp duty	3.7
Capital gains	2.5
Inheritance tax	0.7
Total	25.4

From Table 4.1 it will be seen that a substantial level of funding is currently obtained from existing funding sources in terms of changes in property values. In fact, over £25 billion is collected by government annually from these sources. This level of funding does not cover planning gain related sources of funding. It should also be noted that almost £28 billion of funding is also collected from transport-related sources each year, such as petrol duty and vehicle excise duty.

In practical terms, however, the extent to which these methods capture any incremental increase in land or property values are more determined by political considerations, rather than a reflection of how property values have changed. Thus, over the period between 2000/01 and 2003/04, for example, inheritance tax receipts increased marginally, almost in line with inflation. Capital gains tax, meanwhile, saw a substantial decline in receipts, of the order of 60%. Conversely, stamp duties – particularly those elements associated with property – saw a significant increase over this same period.

In summary, those funding method that are potentially more variable in terms of capturing land value changes – and hence open to capturing a better representation of the impacts of a transport scheme upon property – make up approximately a quarter of the ‘property-related’ taxes referred to in Table 4.1. The rating system, which is more fixed in this respect, captures the remaining 75%.

In simplistic terms existing funding methods could be characterised as capturing an element of value uplifts in property and land associated with factors such as transport improvements, but this may be limited to increases slightly above inflation. However, more detailed investigation would be required to establish this, but at a minimum any new funding method would need to establish carefully the proportion of land value increase associated with a transport improvement that could safely be captured without raising significant issue of equity and accountability.

4.3 Potential Funding Mechanisms

There are a range of potential funding methods that could be used as the basis for capturing land value changes. Based upon other projects carried out by the project teamⁱ 23 potential funding mechanisms of potential relevance to transport

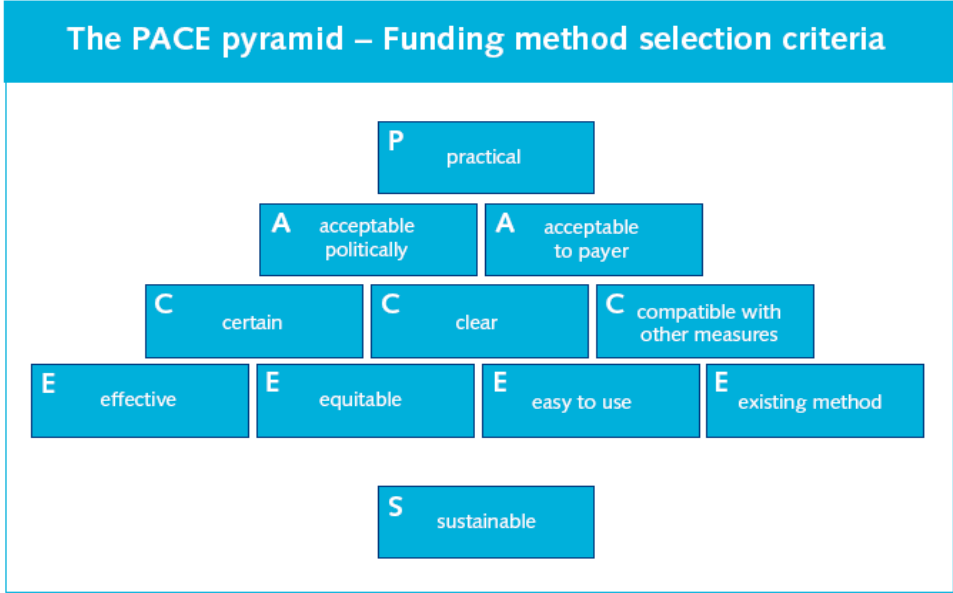
infrastructure schemes were identified. These funding methods were identified through an international review of 'innovative' funding methods.

Not all of these methods are suitable as methods of capturing **land value** increases, as they have a much wider fiscal coverage. In fact, there are eight possible methods that could be used and which focus specifically on changes in land values. These are listed below.

- Business rate levy - Charge on the Rating and Council Tax system, applied locally rather than nationally. Focus is upon tenant/occupier rather than landowner
- Local authority business growth incentives - Expected growth in property tax revenues are securitised to provide funds for infrastructure improvements. The existing or potential uplift in property values caused by a new infrastructure improvement is identified. The associated increase in UBR can then be amortised and used as security for bond finance.
- Business improvement districts - Allows levy to be raised on property in specified area. Proceeds used to fund infrastructure and other improvements
- Land value taxation - Taxation based on value of land. Ranges from application in city context to uplift in land value, through to complete reform of the overall taxation system. It relates to land values rather than property values, and focuses on landowners
- Greenfield development tax - A one-off tax on the sale or granting of planning permission on a 'greenfield' site. The proceeds could be used to fund infrastructure improvements
- Freehold charges - A levy on freehold property in a specific area (either regional or the 'impact area' of a scheme). The levy is applied to the uplift in property values in a specified area as a one-off charge
- Planning gain - A levy on new development in a designated area. This is based on changes in value. In the UK this is typified by Planning Gain (S78 agreements in Scotland).
- Buy-in charges - Methods that involve a 'charge' of some sort for landowners to capitalise on infrastructure improvements. Examples include Connection Charges, Transit Impact Fees, Density Bonusing and Joint Development/Land Acquisition and re-sale. (May require use of CPO powers).

4.4 Assessment of Alternative Funding Methods

A detailed review of each of these alternative funding methods is provided in the main report. This includes the results of evaluating each of these methods against a set of key evaluation criteria. These evaluation criteria are linked through to a set of threshold criteria that were developed into a 'PACE Pyramid' for the study, as illustrated below.



A summary of the results for each of the funding methods is contained in Table 4.2 overleaf. Each funding method is assessed against a set of evaluation criteria. The evaluation table also uses a series of colour codes to summarise results. Green symbolises a good or positive result. Red indicates a poor or negative result. Yellow suggests a more mixed result.

Table 4.2: Summary Evaluation of Land Value Funding Methods

Evaluation Criteria	BR Levy	LABGI	BID	LVT/SVR	GDT	Freehold Charge	Planning Gain	Buy-in
1. Revenue Generation								
Potential	Large	Medium	Small	Large	Medium	Large	Small - Medium	Small
Targeting	Poor	Good	Good	Good	Good	Medium/Good	Good	Medium
Sustainability	Good	Good	Good	Good	Medium	Medium	Poor – Medium	Poor
Possible Controlling Agency	State Agency	State Agency	Private Agency	State Government	Local Authority	Treasury	Local Authority	Local Authority
2. Revenue Allocation								
Winners	PT users	Existing business	Local business	Property occupiers & local community	PT users/ urban areas	Developer/land owner	Local community	Property occupiers
Losers	Property occupiers	Boundary edge occupiers	External business	Land owners/ developer/ funds	Land owner/rural area	Developer/land owner	Developer/land owner	Developer
Assessable by LUTI models	Yes	Yes – indirectly	Yes – indirectly	Yes	Yes	Yes	Yes	Yes
3. Practicality								
Administration	Simple	Simple	Simple	Complex	Variable	Variable	Simple	Simple
User complexity	Simple	Simple	Simple	Variable/ Complex	Variable	Variable	Simple	Simple
Flexibility	Low	High	High	Medium	Medium	Low	High	Medium
Enforceable	Good	Good	Mixed	Good	Good	Good	Good	Mixed
Costs	Low	Mixed	Mixed	High	Mixed	Mixed	Mixed	Low
4. Transparent	Mixed	Clear	Clear	Mixed	Mixed	Clear	Poor	Mixed
5. Transferability								
Legislation availability	Needed	Available	Available	Needed	Needed	Needed	Available	Unclear
Institutional Changes	Minor	Mixed	Mixed	Major	Major	Minor	Minor	Mixed
6. Acceptability								
Public	High - if exclude residential	High	High	Medium	Low/ Medium	High	High	High
Business	Low	High	High	Low/ Medium	Low	Medium/High	Medium	Medium
Political	Medium	High	High	Low/ Medium	Medium	High	Medium/ High	High
7. Link to policy	Low	Medium	Medium	High	High	Medium	High	High
8. Geographical Extent								
National	Yes	No	No	Yes	Yes	Yes	No	No
Regional	Yes	Yes	No	Yes	No	Yes	Uncertain	UncertainNo
Local	Yes	Yes	Yes	Yes	Uncertain	Yes	Yes	Yes

The key evaluation results of each funding method are summarised below:

- Business rate levy – substantial fund raising potential; based upon an existing set of arrangements; likely only to get support for a highly popular transport scheme; would require legislation.
- Local authority business growth incentives – medium fund raising potential; does not charge businesses up-front; directed mainly at regeneration areas; newly enabled method.
- Business improvement districts – small fund raising potential; can be useful for very localised transport improvements, but not for transport infrastructure of any significance; newly enabled method.
- Land value taxation – substantial fund raising potential; can be used as replacement or additional tax, with consequential policy and funding issues; potentially requires a more radical change in practice and procedures than other methods.
- Greenfield development tax – medium fund raising potential; funding level depends upon level of activity; may ‘transfer’ activity between local authorities; requires legislation.
- Freehold charges – substantial fund raising potential; one-off charge theoretically, so there may be issues over how effectively and equitably to collect the charge; would require legislation.
- Planning gain – medium fund raising potential; can only be related to a specific development; an existing method.
- Buy-in charges – medium fund raising potential; useful for local transport schemes, but not larger schemes; would require legislation for some approaches.

The eight funding methods were tested through a high-level application at the City of Aberdeen and Clackmannanshire. This primarily focussed upon the level of funding that could be generated by these funding methods, but was linked to an overall ‘in-principle’ evaluation of the funding methods.

A definitive recommendation of which funding method, if any, to pursue was not made. All of the funding methods are technically capable of being applied in practice, with each having relative advantages and disadvantages, but ultimately it will require a political decision as to whether to pursue such funding approaches.

There would be particular value in testing the funding methods in detail in relation to an actual transport scheme. If this was carried out in conjunction with the detailed application of T-IMPROVE, this would provide considerably more benefits. The testing of the funding methods should be in ‘shadow’ form – in other words, no actual money should be collected.

5. DISCUSSION

5.1 Introduction

This section of the report draws together some of the key issues arising from the research and discusses how matters can be taken forward.

5.2 Discussion

This project has looked at the potential for land value capture to be used to fund public transport projects. This has involved looking at how to measure land value changes and has assessed methods that could be used to capture changes in values. The results of this have been summarised earlier in this paper, but see the main report for fuller details.

In addressing the 'potential' for land value capture two distinct but related questions need to be tackled. Firstly, can land value changes be measured and captured? Secondly, should they be?

In broad terms, land value change can be measured – through the T-IMPROVE method – and there are various methods by which such changes in value can be captured.

This is a key point, as it is necessary to demonstrate beyond reasonable doubt that the enhancement of property values results from a transport improvement, as well as to identify the scale of that change. Without this it is unlikely that the 'value capture' method would be seen as politically acceptable, and any charge resulting from it seen as an exploitative tax rather than an equitable charge.

The T-IMPROVE method summarised in this paper demonstrates that it is technically possible to measure the changes in land value due to the provision of transport infrastructure schemes. To do so effectively is a major undertaking and would need to run over several years.

A key point to note, however, is that T-IMPROVE is an empirically-based measurement tool – it records what the impacts of a transport scheme **have** been upon factors such as land values. It would be very beneficial to apply this to an actual scheme – and ideally several schemes - to provide hard evidence of the potential impacts of a transport scheme on land values, and this is a recommendation of this study.

However, T-IMPROVE is not, in the form developed so far, a predictive tool. In many respects this is what is needed in order to apply a land value capture funding method. In other words, it is necessary to know the likely impacts of a transport scheme on land values so that it can be determined how much 'value gain' is to be secured to support the transport scheme.

A critical point to note, however, is that even a predictive method needs to be verified – i.e. is checked to see if the level of increase in value actually occurred. This reinforces the point that there would be considerable benefit in

applying the T-IMPROVE method in the very near future in order to develop the necessary data profile to support a predictive approach to land value measurement.

As a corollary of the above, the potential for various land use transport interaction (LUTI) modelling approaches was examined as a means of providing a predictive approach to land value measurement. From this we concluded that there was considerable potential to achieve this, although existing LUTI models would need further work to enable this to happen.

A key issue, therefore, is whether, when and how such an application would be undertaken. Our recommendation is that it should be pursued irrespective of whether land value itself is to be pursued, since there are likely to be wider benefits from developing such a predictive approach, for example, to assist in financial appraisals of transport projects.

In short, land value change can be measured with reasonable accuracy as it occurs through T-IMPROVE. There is also good potential of being able to develop predictive models based upon LUTI model applications.

A number of potentially relevant alternative funding methods were also examined and which could be used to capture land value change (implicitly meaning increases in value). In the most limited sense, all of these funding methods could 'work', in as much as they can capture land value change. However, they differ markedly in terms of how effective they are at doing this, and how they deal with matters of equity, timeliness and other key concerns.

Section 4 discussed the relative merits of each funding method, presented in the form of a summary evaluation framework. This could be used as a platform for evaluating if a particular method is suitable for a particular scheme.

A further issue is whether such funding methods should be applied singularly or in combination. Much would depend upon local circumstances, but as a general principle it is suggested that the alternative funding methods reviewed should not be used in combination unless a formal impact assessment is carried out. A careful examination of the groups likely to have to 'pay' under each of the funding methods would need to be undertaken in order to assess the scale of potential 'double-taxation'. As an example, if a freehold charge and greenfield development tax were introduced, then land owners could arguably be charged twice.

This brings us back to the second question posed at the start of this section – should land value capture be pursued using alternative funding methods? This is a more fundamental and problematic question, and one that, ultimately, will be a political decision.

To a certain extent, changes in land values are already captured, in part at least, through existing arrangements. This includes measures such as rates, stamp duty, capital gains tax, and inheritance tax. In Scotland, these sources could amount to over £2 billion per annum, and this excludes funds raised through transport-related taxes and charges, such as petrol duty. However,

this funding level relates to total receipts, not simply incremental increases that may arise because of measures such as improved transport. Even so, it would seem logical to conclude that a certain amount of land value change is captured already using existing methods.

There are issues about how transparent existing mechanisms for collecting part of land value changes are, as well as debate about how equitably they operate. This is part of the rationale for the Balance of Funding review that was carried out by the ODPM, which investigated better ways of financing local government. The results of this review, for example, may help inform decisions as to whether a more fundamental reform of local government funding is to be pursued, or whether the approach is a modification of the existing system.

This, in turn, will influence how alternative funding methods could be used. At the most simplistic level, the pursuit of a radical overhaul of existing funding systems would encourage the application of alternative funding methods such as land value taxation. If a more modest reform agenda is pursued, then this might encourage less radical alternative funding methods, such as a business rate levy or LABGIs. Currently, the UK Government is exploring the Planning Gain Supplement proposal from the Barker Review, which is effectively an extension of the planning gain funding method.

From a policy perspective, however, it is important to have a fuller understanding of the scale of existing land value capture. It appears evident that it is captured, but the full extent of capture is unclear, as is whether it is equal in all cases. The issue is important as it could determine the extent to which additional land value capture can be reasonably sought. Initial views are that the capture process is blunt, but nevertheless it does occur. This suggests that the extent of any land value increase associated with a transport scheme that would be captured by existing methods (e.g. the rating system) should be identified. This will therefore identify the residual potential land value increase that could be subject to any land value capture mechanism.

There are wider policy issues to consider arising from the research. However, it needs to be recognised that this research has essentially been dealing with technical processes – methods which, of themselves, have only indirect policy implications. As an example, T-IMPROVE is concerned with measuring land value change. The extent to which this has planning or transport policy implications can differ widely depending upon how such information is used.

Nevertheless, some very broad potential policy issues can be raised. These need to be recognised as indicators, rather than detailed assessments.

Arguably, capturing land value enhancements associated with transport schemes is likely to be of more benefit in supporting transport policy – although indirectly – than in supporting planning policy. This would primarily be in terms of off-setting some of the costs of building the transport scheme that is leading to increases in land values.

The wider policy implications are likely to relate to decisions on how to use or apply any value enhancements associated with a transport scheme. Thus, the research has examined the means by which value change can be identified, and assessed methods by which some of this value can be clawed-back for the wider 'public good'. To a large extent, as mentioned above, these are largely 'procedural' matters.

What is of particular relevance from a policy perspective, is how any 'value clawback' is applied in practice. Before considering this, however, it is important to recognise that greater clarity is needed in understanding how much additional value enhancement there is from the transport scheme in question. In other words, how far has 'value capture' from existing mechanisms, such as rates, been taken into account. It is legitimate to consider this factor in a policy context to ensure that the benefits and costs of a transport scheme are equitably dealt with.

There are a number of broad policy implications relating to how 'value clawback' can be used in practice. This does assume, of course, that such value enhancement has been identified or estimated and a method put in place to capture this value uplift. This in itself is a major policy issue. The broad policy implications can be summarised as follows:

- (a) **Planning purposes.** The funds obtained using land value capture methods can be used to support projects or initiatives of a primarily planning nature. These may or may not be related to the transport scheme in question. This might include, for example, funding for affordable housing.
- (b) **Transport purposes.** The funds obtained using land value capture methods can be used to support primarily transport objectives. This may simply be to pay for the transport scheme in question, or to support funding for complementary transport measures.
- (c) **Treasury.** All, or a substantial proportion, of the funds generated from land value capture methods may be secured under the control of the Treasury. In that situation, the potential policy uses of such funds may be more limited, along with access to the funds.
- (d) **Policy adjustment.** This is a more radical area and covers a range of possibilities. It could involve reducing or deferring land value capture rates for 'positive' or encouraged land uses around the transport scheme in question (or wider afield if the value capture method was of a more general nature). A slightly different approach would be to use the funds obtained from less priority or 'desirable' land uses in the scheme boundary to support higher priority land uses.
- (e) **Operational mechanisms.** Introducing land value capture methods may, in practice, be likely to have an influence upon wider policy development. As an example, compensation

mechanisms may need to be in place to deal with cases where land values reduce as a result of a transport scheme. This may therefore influence policy decisions on, say, the nature of a transport scheme proposed.

- (f) **Option modelling.** Having a method by which the land value changes of a transport improvement can be measured can enable alternative options or scenarios to be assessed. In other words, different transport schemes for the same route may give rise to different land value capture potential, which may, in turn, help determine which transport scheme to pursue.

Issues (a) and (b) above are likely, in practice, to be less fundamental or complex than issues (c) to (f). Issue (c) will be significant in deciding how much 'local' control there will be in terms of both policy development, as well as levels of funding. It will be a relevant factor in judging which form of land value capture method was most appropriate to pursue, if such a course was to be adopted.

Issues (d) to (f) are more fundamental. For this reason firm views are difficult to develop. However, the issues raised under point (d) are likely to be constrained by planning legislation and guidance. The points raised under (e) and (f) can, to some extent, be examined through LUTI modelling, but they are likely to give rise to key planning and transport policy choices.

The above points raise the issue as to whether the measurement of land value change should be undertaken. Ultimately, this will depend upon whether any element of any value increase is to be captured for the public good, beyond that which is captured already. However, the measurement of land value change due to transport infrastructure provision can be of benefit, from a policy perspective, in understanding the nature and scale of impact of various transport schemes.

From a simplistic perspective, this could demonstrate whether a particular transport investment provided a level of land value increase that could help stimulate regeneration. It would also help provide a better evidence base to guide the public and private sector on the optimum time to invest or provide support for a particular project to ensure maximum benefits, at least financially. Again, as a simple example, if a public agency has acquired or owns land surrounding a new transport scheme, is it likely to be more advantageous – all other things being equal - to dispose of this shortly after the scheme is built, at a later date, or on a phased basis?

The principle adopted here is that such a measurement process should be undertaken, not least because it will provide empirical evidence in a Scottish context for future discussion in this area.

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APPENDIX 1: LITERATURE REVIEW RESULTS

Five key issues were identified from the review, namely:

- Treatment of time
- Scale of effects
- Catchment area
- Methods and data
- Attribution of impacts

These are considered to be the key features that any land value measurement method needs to address. The key findings of relevance on the above, and other, features, from the literature review are summarised below. However, it is only through a bottom up approach that the land value uplift effects can be isolated.

1. Much of the analytical and empirical research comes from the USA and Canada, and this has mainly concentrated on the commercial property market. It seems that the quality and availability of data from North America is good and allows the use of more sophisticated methods, including regression analysis and hedonic pricing.
2. The evidence from the UK and Europe is more varied, but does include individual case studies and comprehensive reviews. There seem to be less time series or repeated cross sectional data available for analysis. The use of more simple indicators such as transactional price analysis, growth assessment and projected rateable values has been explored.
3. Until recently, UK and European research has tended to concentrate on the transport impacts in terms of more traditional changes in demand patterns and the switching of travel to the new mode. There has been less interest in the property market effects. But this has now changed, with much of the recent work from key researchers and the property market sector itself being concentrated on the land and property value uplift effects of transport. This work has concentrated on the residential sector, where there is reasonable quality data from the land registry, the Valuation Office and other agencies.
4. From the extensive literature cited, 18 key references were selected for more in depth analysis. It seems that the expected effect on both the residential and commercial property markets is positive, but the range of impacts is very variable – from marginal to over 100% in the commercial sector from the North American evidence. In the UK the impact is seen as being positive, but there has been less emphasis put on exact amounts. However, some of this uplift may be due to the optimism of the markets rather than actual effects. Where

possible, it is important to use transactional data rather than valuation data¹.

5. One conclusion here is that each study is different and the bringing together of results in the review has been difficult. It requires a greater depth of investigation that looks at data, definitions, methods and actual cases to unravel what effects can be attributed to the transport investment. This means that knowledge must be built up from a series of carefully constructed case studies.
6. The treatment of time is important in all studies. This is because changes will take place in land and property values in advance of the completion of the transport investment as developers and house builders will invest in the expectation of improvements in the transport infrastructure. Effects might also be expected immediately after the transport investment is opened, and further in the future as the full benefits are recognised. Ideally, data should be available from before the decision to build was taken and immediately after opening, as well as downstream. A continuous database is ideal, but data are needed for at least these three – and ideally four – points in time.
7. Catchment areas are also important. The impact area for residential developments seems to be wider than those for commercial developments. Depending on the investment, residential impacts could extend to 1000m, whilst those for commercial developments are likely to be concentrated in a 800m radius. There is also some evidence that residential property prices might be depressed immediately around the transport investment or station, often due to environmental factors such as noise levels.
8. Most studies seem to take a series of key thresholds as inputs to the study of where different types of impacts might be found. Only a few used the data to define the range of distances away from the transport investment at which impacts might be found.
9. Impacts are more easily identified for tram and metro investments than for bus investments. Most of the research has concentrated on urban rail systems. In the first instance, rail investments offer the best opportunities to test for the property market effects.
10. Although the analysis has produced variable results, there is also the question of attribution of impacts. It seems that the contextual

¹ It is possible to use transaction or valuation data. The advantages of transaction data are that these are the actual prices paid in property transactions and they are available from official sources at the individual levels (although they would have to be aggregated for presentation purposes to avoid confidentiality issues). These reflect both residential and commercial property transactions. Valuation data is based on local expertise and the knowledge of the property market (e.g. from estate agents and valuation officers). The difficulty here is that often the valuations do not reflect the actual market, but their perceptions of the market – hence prices are “talked up”. It is better to use the real data if at all possible, and only to rely on valuation data if the real data are not available. In discussions with property market experts in Croydon, it proved very difficult to get agents to give clear advice on the effects of the Tramlink on property values.

situation is important and should be seen as an input to any analysis. Similar transport investments will have different impacts in locations where there is a vibrant local economy and where the economic conditions are less advantageous. The key question then becomes, what other actions are needed in an area apart from the transport investment to make a measurable impact in terms of value uplift?

11. Value uplift has tended to be looked at in the literature in a narrow way, mainly through changes in property and land values. Where possible, a wider range of measures should be used. These would include changes in accessibility, ownership patterns for land and property, site consolidations, numbers of transactions and yields, as well as the use of composite measures such as density of development.

APPENDIX 2: THE LAND VALUE MEASUREMENT METHOD

Land value method: Transport-Investment and Measurement of PROperty Value Enhancement (T-IMPROVE)

The T-IMPROVE methodology has been developed from the information examined from the extensive literature review, and from the experience of testing the draft methodology in Croydon. It is a combination of a top down and a bottom up approach and it is summarised as a three stage process in the graphic below (Figure 1).

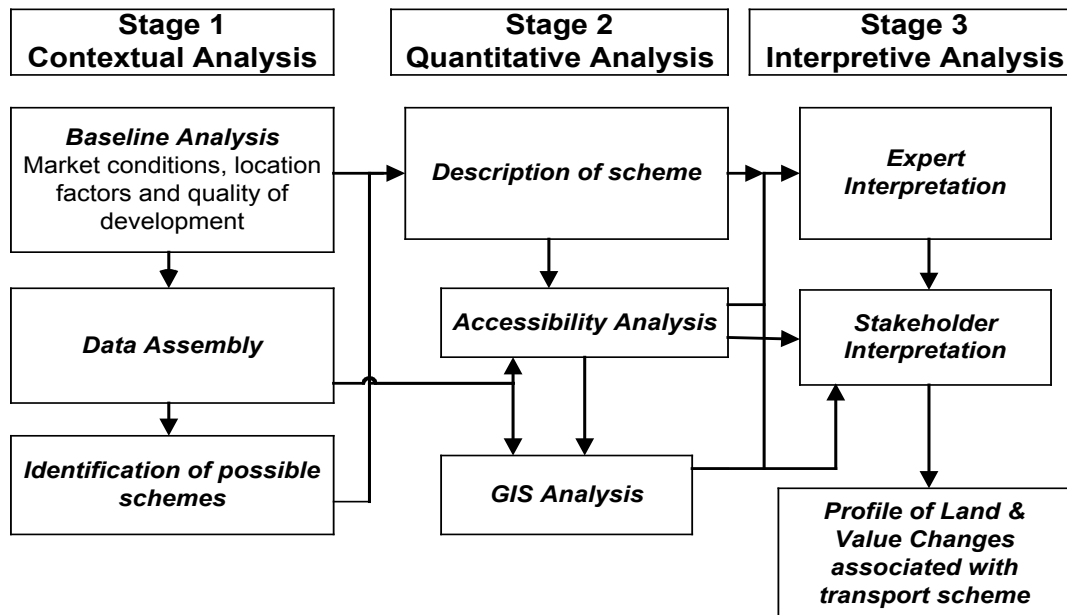


Figure 1: The Structure of the Land Value Uplift Methodology

1. **Stage 1: Contextual Analysis** – this *baseline analysis* uses secondary information to provide a picture of what is going on in the economy more generally with respect to three interrelated areas:

- Market conditions
- Location factors
- Quality of development

The contextual analysis is important at the regional level (to cover the transport investment effects as a whole), and at the local level (as impacts from the investment have a differential effect by location).

Data Assembly - A range of secondary sources can be used to get some “feel” for change – census information, employment data, local planning decisions (and applications), skills of population, transport trends, inward investment, land ownership and availability.

In addition to the context, it is important to have land and property value information as it relates to the numbers and locations of residential and

commercial transactions – such as land registry and valuation office information, register of Sasines, information from the Scottish Property Network, etc.

This contextual information provides three important inputs to the analysis:

- It gives an understanding about what is happening over time within the study area, and how this relates more generally to the property cycle.
- It helps identify suitable projects for investigation.
- It provides some of the explanation of the impacts that can then be used to structure the interpretative analysis in Stage 3.

Identification of schemes – Discussions need to be held with local transport planners and operators to help identify suitable schemes for study, both in terms of their characteristics, and in terms of the availability of suitable data over a period of time.

2. Stage 2 – Quantitative Analysis – this is the core of the analysis, and it needs to be carried out over the appropriate time period and to use data on individual property transactions.

There are three interrelated parts to the quantitative analysis:

- Description of the scheme
- Accessibility analysis
- GIS analysis

Description of the Scheme – covers the route, frequency of service (for public transport), demand estimates (and actual use at out-turn), timing of the investment, key nodes (or interchanges), and the costs of the scheme.

The Accessibility Analysis – This estimates the changes in travel times before and after the scheme. This needs to be carried out at a very local scale, as in many urban areas there is little change resulting from a transport investment, as accessibility is already very highⁱⁱ. This accessibility analysis complements the property value analysis, as it would be expected that most increase should link closely with accessibility change.

The GIS Analysis – allows data surfaces to be constructed for property price changes over space and time using transaction cost information. The basic Inverse Distance Weighting method allows the surfaces to be drawn and to then map the data according to whether prices are higher or lower than expected (i.e. the study area mean value). More complex Geographically Weighted Regression would allow other factors relating to the property (e.g. size, floor space and age) and the locality (e.g. proximity to services and facilities and density) to be controlled for.

3. **Stage 3 – Interpretative Analysis** – this important third stage can be divided into two main parts:

Expert Interpretation – this uses the output from the contextual and quantitative analyses to establish what effects the transport investment has had on property values in terms of their location and when the change has occurred. Links can be drawn between the accessibility analysis and the GIS analysis, and further analysis may be made to correlate the changes observed with business confidence, indicators of change (e.g. employment and image) and other investments taking place.

The output is the experts' views (the research team) on the land value uplift. A second output would be a commentary on what funding mechanisms might be most appropriate to use to recapture some of that uplift.

Stakeholder Interpretation – the results, together with the expert interpretation and commentary, would then be presented to focus groups of key actors. The involvement of business and property interests at this stage is seen as important to help with the interpretation of the quantitative analysis and to understand issues relating to impact and causality. Focus groups are seen as being more effective than questionnaires, and they aim to encourage discussion and convergence of views. The focus group meetings would help modify the expert interpretations and to discuss the value capture alternatives.

Profile of Land and Property Value Changes Associated with the Transport Scheme – this is the final output from the analysis. It would consist of a profile of land value changes associated with the transport scheme, together with a full explanation of the complexity of the interactions that have taken place over time and by location.

Recommendations on key variables

In the development of the methodology key variables that needed to be included in the land value uplift methodology, (T-IMPROVE), were identified and assessed. The results of this are summarised below.

The structure of the argument is clear, namely that new transport infrastructure investment increases accessibility, and this in turn results in additional demand for land and property around the stops, stations and interchanges. Over time there may also be second round effects as new development takes place and as new uses are found for existing development. Throughout the literature review, the impacts have been found to be positive but very variable (in terms of scale and location). In the Croydon Tram Link (CTL) case study, the impacts were also found to be variable.

This means that analysis needs to be carried out along the whole corridor under study, as effects are expected to be variable in their scale and location. This would include the network effects and commentary on missing links – **Recommendation 1.**

For public transport investments, measurable impacts are more likely to be found for rail and tram/metro investments, where there is a substantial improvement in accessibility and where there are discrete stops or stations around which land value changes can be identified. In the CTL study, land value change is difficult to observe, as the tram stops are very frequent (38 on the 28km system). For road investments, one would expect a similar situation, as the larger scale motorway or limited access investments would have greater accessibility impacts and concentrate land value change at the intersections.

Case studies should be concentrated on larger scale investments with limited access points as this provides the greatest potential for identification of land value uplift – an accessibility analysis should be carried out to determine the scale of change brought about by the investment - **Recommendation 2.**

There does seem to be consistency in thresholds over which impacts are to be found. The 800 m threshold for commercial properties and the 1000 m threshold for residential properties both come through as being consistent in the literature. The 1000 m threshold was used in the CTL. Note that very few studies have been able to use a control area to compare actual outcomes with those elsewhere in the local area (the counterfactual situation). The alternative approach is to use the distance decay argument, where impacts decay to thresholds, and it is assumed that beyond those thresholds no measurable impacts can be found.

Property market effects are expected to be concentrated either at up to 800m and 1000m distances from the stop, station or interchange, depending on the type of development – **Recommendation 3.**

It seems that changes in land values occur before the investment is completed and open, as well as over time. This means that the analysis should be based on data collected at four points in time. This is a conclusion from the CTL study, where data was used for two points of time prior to opening and one afterwards.

Data are required before the announcement of the investment, prior to opening, immediately after the opening and some 5-10 years later – **Recommendation 4.**

Two methods provide the most robust means for analysis, and this is confirmed in both the review and the CTL study. GIS methods allow data surfaces to be constructed for land value and property price changes over space and time, but it creates problems for interpretation when trying to control for other changes taking place – Geographically Weighted Regression should address these problems.

Hedonic Pricing (HP) methods fit regression equations to value and price changes, but at the same time include other control variables. HP methods are

not explicitly spatial in their analysis, but can be extended to incorporate GIS surfaces.

However, the modelling research undertaken as part of the research has identified additional approaches that could usefully support the above methods, or act as alternatives to certain elements of these methods. Further work is required in this area to translate this into practical results.

There seems to be some convergence here between the two most effective methods, probably with GIS methods having the edge as they are explicitly spatial and make less assumptions than HP methods for time series analysis – **Recommendation 5.**

Quality data is crucial to the effectiveness of the detailed analysis, and the assessment of the wider contextual changes taking place. To identify land value and property market changes, data are needed for individual transactions. This means data should be at the unit post code level, which locates transactions at the 10-15 unit delivery point level. As aggregation takes place, the effects of the investment becomes harder to identify. The absence of data at this level of detail has been a major limitation on studies in the UK, and only in the US does it seem that this data is publicly available. The CTL study is one of the first (if not the first) in the UK to make use of this level of data.

Effective analysis depends on transaction data at the unit post code level (i.e. the full post code) – **Recommendation 6.**

In addition to the transaction data, the heterogeneity of the market means that data on other important variables should also be available. Information is required on the quality of the land or the property (condition, size, age etc), on the local availability of other facilities or services (shops, schools etc), and on the broader local market conditions (employment, skills, inward investment, planning applications etc). Some primary data collection may be necessary, but in both the review and the CTL study extensive use has been made of secondary data sources.

A database of changes in other related factors is required for the local area, and the broader area within which it is embedded for the time period under study – **Recommendation 7.**

Within the context of these seven general conclusions above, there are more detailed comments on the exact nature of the variables needed to measure land value uplift. They can be grouped at three separate levels, relating to the individual property or land parcel, those relating to the locality, and those relating to the wider urban (or rural) area.

1. Those relating to the land and property markets – **Local Data**
 - i Property or land transaction value
 - ii Growth assessments and projected rateable values

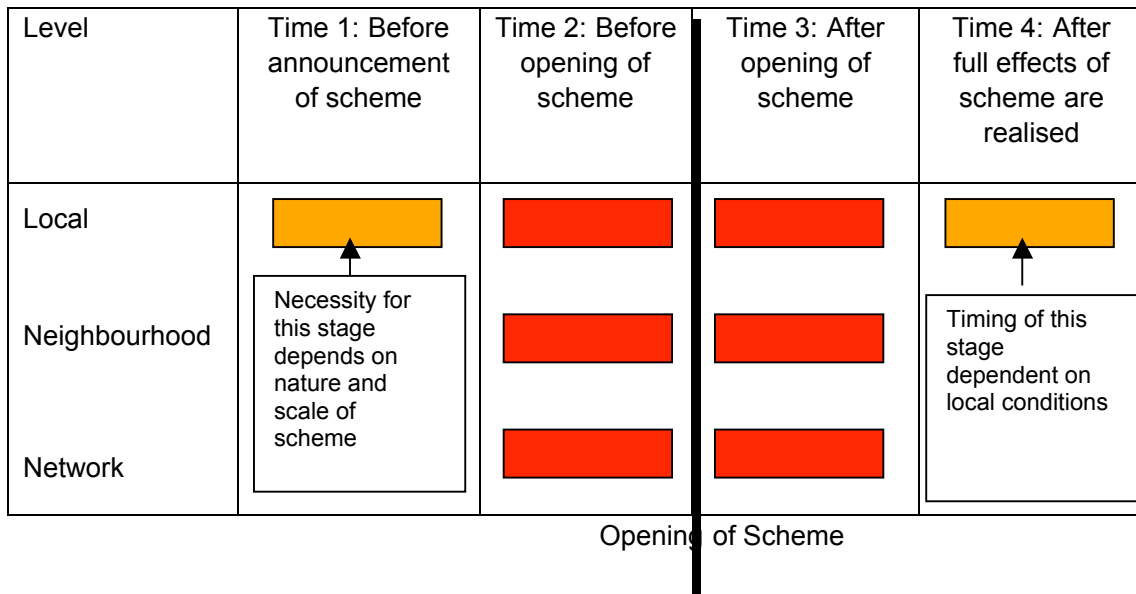
- iii Quality of property – including size (bedrooms or plot size), floorspace, age
 - iv Type of property – residential, office, industrial, retail or other
 - v Residential – detached, semi-detached, terraced, maisonette or flat
 - vi Availability of parking – public and private and location
2. Those relating to the locality around the transport investment – **Neighbourhood Data**
- i Proximity to local services – schools, shops, health centres, libraries etc
 - ii Accessibility to employment
 - iii Accessibility to amenities – parks, open countryside, main roads, railways etc
 - iv Nearness to disamenities – industry, pollution generators (e.g. power stations)
 - v Density of development and mixed uses
 - vi Income effects or levels of deprivation in local area (employment, social or economic) – commentary on links to wider local economic factors
 - vii Vacancy rates in locality – for property and land
3. Those relating to the wider urban (or rural) area as a whole – **Network Data**
- i Local levels of employment and journey to work patterns
 - ii Skills levels of population and travel patterns
 - iii Planning applications – new development and change of use
 - iv Inward investment
 - v Trends in property and building cycles – local market conditions
 - vi Quality of area – civic pride and image and developer interest
 - vii Other indicators – position in Experian’s retail rankings

Additional information would need to be collected on the history and development of the transport investment project under consideration. The proposed database has three main scales of evidence that need to be assembled.

- The *local level* detail is required for the GIS (or hedonic pricing) analysis at the individual property transaction level over a period of time (four points).

- The *neighbourhood level* is primarily an extended accessibility analysis that measures the scale of change before and after (two points) the investment to a range of local facilities, and it also gives a picture of the quality of the local area (e.g. density, income, deprivation and vacancy rates).
- The highest level embeds the investment in the wider area through analysis of the *network*, linking the transport change to the local economic factors, before and after the changes (two points – Figure 2).

Figure 2: Data Collection Points



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NOTES

ⁱ RICS (2003) *Funding London's Transport Needs* and Advantage West Midlands (2004) *Innovative Forms of Transport Funding*

ⁱⁱ ACCMAP was used in the Croydon study. It is a GIS based software that combines OSCAR maps of the road network with public transport information on routes, stations, stops and frequencies. The software package produces isochrone maps to determine accessibility before and after any investment (or change in the public transport service characteristics) and to estimate the time savings. In Croydon, public transport accessibility was mapped to four destinations (Central Croydon, Central Wimbledon, Elmers End and New Addington) within a 30 minute journey time, subdivided into 5 minute segments.