International Transport Forum

Land-value capture and public transport funding

Background paper

This background paper is part of a package of materials accompanying the final report of an International Transport Forum Working Group, entitled *The Future of Public Transport Funding*.

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Introduction

There is increasing interest in the potential of a broad range of land-value capture (LVC) mechanisms to help fund transport. Government investments in transport infrastructure increase the value of nearby land (so-called land-value uplift, or LVU) to both residential and business occupiers by making it more accessible. Without extracting some of this increase in value, the unearned benefit becomes a windfall gain to the land owner.

By contrast, when beneficiaries including businesses, landowners and property investors contribute some or all of the LVU to the funding of major public transport infrastructure investments, such LVC mechanisms can provide an efficient and equitable funding source for governments seeking public transport infrastructure investments. LVC mechanisms can contribute significantly to funding major transport infrastructure projects, particularly those connected to pre-existing networks and those undertaken in large, densely populated cities.

However, wide variations in the timing, size and distribution of gains from transit investments in different spatial contexts mean LVC approaches will necessarily vary. Adopting a clear LVC policy, including a legal definition and policy rationale, can improve efficiency, avoid adverse equity outcomes, and underpin public acceptance.

Identifying critical process principles, including adequate consultation with affected parties, can also contribute to successful LVC. Equity objectives will determine choices and public acceptability is crucial. In many cases, combining several LVC instruments will be the most effective means of maximising the share of project funding obtainable from LVC while guaranteeing equity.

Simple LVC systems that do not require periodic recalculation of the LVU are likely to be more acceptable. For example, property developers subject to obligatory and voluntary development charges could contribute to enhancing public transport in return for planning permission.

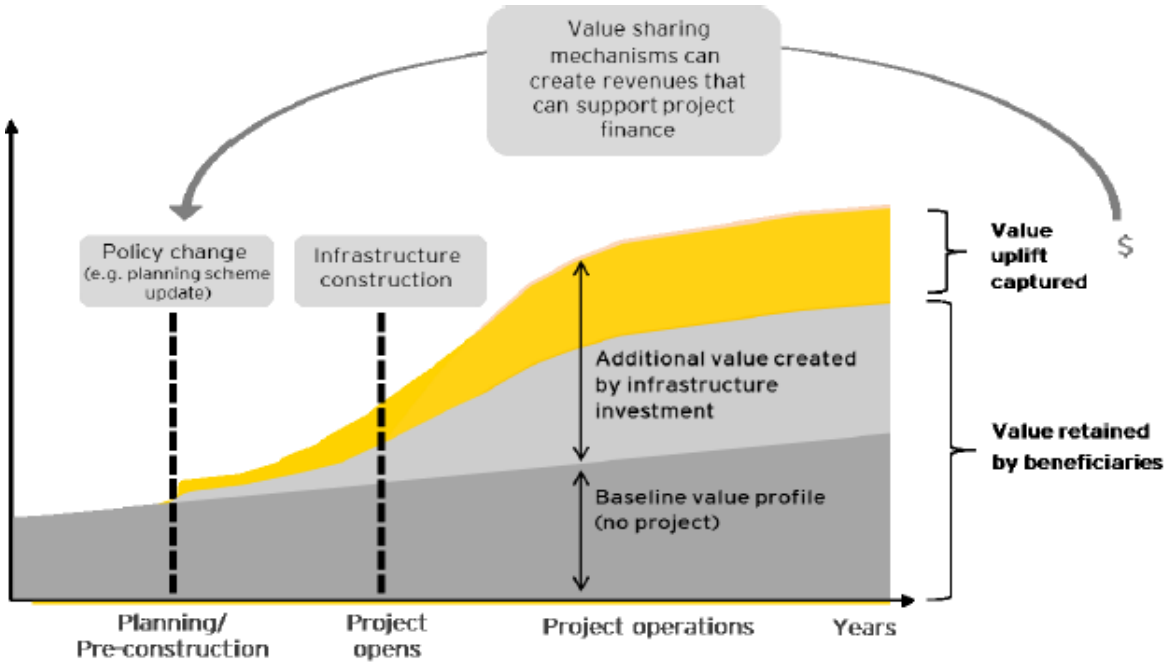
What is land-value capture?

The OECD defines land value capture (LVC) as the set of policy instruments that allow governments to capture the land value uplift (LVU) generated by public interventions, such as infrastructure investments or administrative action (OECD 2022). The potential for efficient LVC depends on the presence of LVU due to some government action. Figure 1 provides a schematic representation of the two concepts.

The figure shows that LVU can commence when a project is announced, effectively capitalising expected future benefits in current land values. The amount of LVU is likely to increase during the construction phase and to rise further after the new infrastructure becomes operational as its indirect benefits become clearer. However, the timing of LVU varies significantly between projects, greatly complicating the implementation of LVC.

The OECD describes the primary rationale for LVC policies as follows: "Traditional fiscal policies largely ignore the fact that the cost of providing urban infrastructure is public, but some of the economic benefits, notably those that materialise in higher prices of land are private, meaning that landowners typically reap unearned wealth." It also argues for the efficiency benefits of LVC: "By tapping into the windfall profits public investment and urban planning generates in land ownership, it may also avoid the distortions that taxation imposes on economic incentives. In this way, it may help direct efforts away from rent-seeking behaviour, such as acquiring land simply to realise value gains, towards gainful economic activity".

Figure 1. Conceptualising land value uplift and land value capture



Source: Department of Infrastructure and Regional Development (2016).

The foundations of LVU lie in the land rent theory developed by Alonso (1964) and Muth (1969), which analyses the relationship between accessibility and land value. It outlines how land rent (the annualised capital value) reflects accessibility levels, with higher rents reflecting greater accessibility. Building new

transport infrastructure increases accessibility, increasing rental values, and hence land values, creating LVU. Rental values are also influenced by the zoning status of land (a regulatory constraint on the theoretical 'best use' value of land). Thus, the extent of LVU depends on both the zoning of the land and the extent of the accessibility gain. A change in land zoning itself creates LVU and yields windfall gains to owners, which may or may not be captured (wholly or in part) via LVC, depending on whether a mechanism is in place.

Accessibility can be defined in different ways but, put simply, is a measure of the ease with which individuals can reach activities or destinations. Providing new or improved infrastructure, or extending existing infrastructure enhances the level of accessibility of neighbouring residential and commercial properties because some activities or destinations can be reached more quickly or more cheaply. Thus, the accessibility changes drive the changes in land value, delivering LVU.

The following section first looks at the factors influencing the extent of the LVU, which provides the underlying potential for LVC. It then provides a taxonomy of possible instruments for LVC before discussing practices worldwide. The final section sets out recommendations for using LVC effectively in the public transport context.

Factors influencing land value uplift

Assessing LVU is more complex than the relatively simple theory outlined above suggests. The published evidence reports widely differing results, calculated using various methods. It also shows the extent of LVU is very context dependent. Several factors influence the reported results, including:

- whether the uplift accrues to existing residential or commercial properties or new developments;
- the mode of the public transport investment,
- the nature of the affected neighbourhoods (density, land use mix and socio-demographics);
- the quality of the investment (is there dedicated road space or mixed traffic?); and
- whether LVU is due to the expansion of an existing network or the provision of an entirely new link.

The reported results also show wide differences in the geographical distribution of the uplift in a single location and its timing (i.e., whether it begins to accrue at project announcement, the start of construction, or the opening of the new transport service).

The theory suggests that improved accessibility changes the value of unimproved land (i.e., land without structures or buildings). However, this increase in value will occur in respect of both unimproved land and land improved via existing buildings or structures. This presents the first issue in identifying the size of LVU. Data on the market prices of properties are available mainly for improved land. Thus, empirical studies need to control for property characteristics. In the absence of market prices, asking prices or rental values have been used in studies, but these, too, need to be adjusted by property characteristics. Alternatively, as most jurisdictions impose land taxes based on unimproved land values or hypothetical unimproved land values where the land is already 'improved', these can be used in empirical work. However, this requires that the valuations used in the tax system are correct. Because revaluations are often infrequent, this presents another difficulty.

Much of the variation in LVU estimates in the literature appears to be due to the studies examining different contexts using different methodologies. Several methods have been used. Early studies used comparative methods, which look at before and after prices using average changes in market prices. However, these typically do not consider other factors driving changes in house prices, such as changes to the socio-demographic nature of the area, the provision of local amenities, or, indeed, that bigger properties achieve higher prices. More sophisticated hedonic modelling is used in many studies. It overcomes these deficiencies of comparative methods by valuing the different components which make up a house price, such as the number of bedrooms and bathrooms, whether there is parking, neighbourhood effects, and (importantly for LVU) accessibility. However, hedonic modelling requires strict assumptions, and the hedonic modelling of property prices fails to meet some of these (e.g., the spatial connections between a house's desirability and where it is).

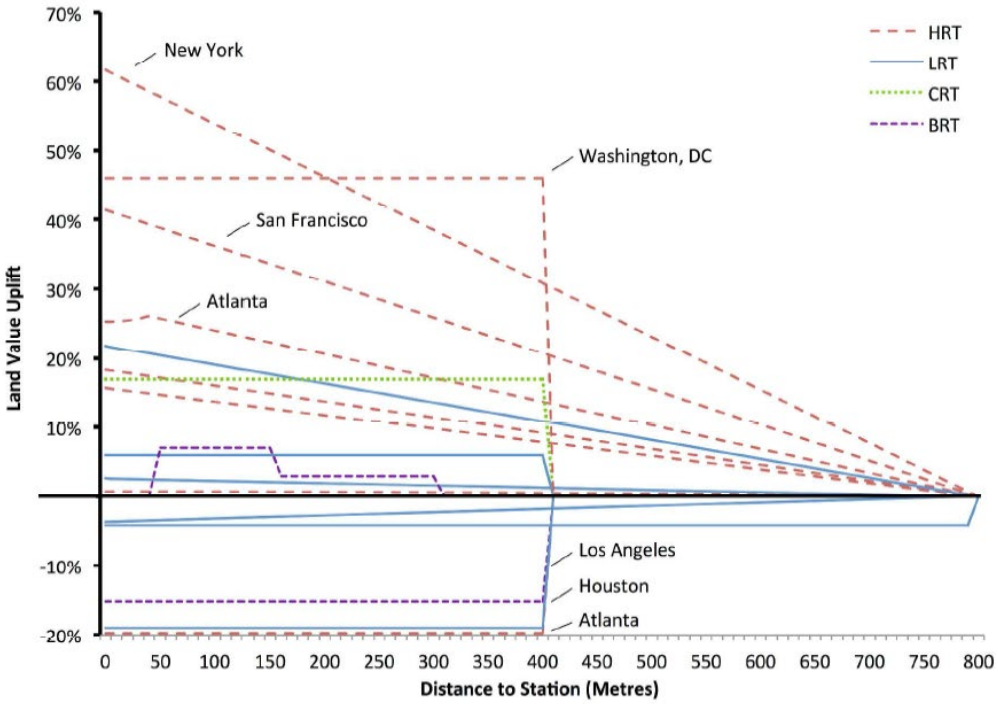
Greater computing power has overcome some of these problems by enabling spatial modelling, which controls for the spatial autocorrelation that gives rise to problems. These models identify the LVU for the areas defined by the study. However, these are typically specified in terms of administrative boundaries, which may have no real relationship to the underlying housing market. Another spatial modelling technique, Geographically Weighted Regression (GWR), avoids this limitation by looking at each data point in space – but suffers some other problems and is very data-intensive. More recently, difference in

difference methods and multi-level models have seen an upsurge of interest. These are superior versions of the earlier comparative methods and compare the areas of interest with areas unaffected by the intervention.

Empirical studies of LVU for existing properties tend to focus more on residential than commercial properties. This is partly due to data availability, since much commercial property data is commercially sensitive, but also because entrepreneurs are seen as more likely to internalise the LVU in assessing land value. This is especially true of new developments.

Notwithstanding these caveats, the evidence from empirical studies in the United States suggests rail-based investments, particularly heavy rail, yield the highest LVU (Figure 17). Light rail LVU depends on the quality of the intervention. In particular, light rail schemes that operate partly or wholly in mixed traffic bring lower LVU, most likely because of lower travel time benefits. Bus-based interventions, such as bus rapid transit (BRT), yield lower, and sometimes negative, LVU, perhaps because they are seen as being less permanent, even when there is dedicated infrastructure. Figure 1 also shows from one study how uplift declines as the distance from the station to the affected land increases.

Figure 2. LVU due to access to a rapid transit service (United States)



Source: Higgins & Kanaroglou (2016).

Table 1 shows that LVU averages around 10%, but the range of reported values varies widely. Heavy rail has the lowest mean uplift and the broadest range of observed uplift levels. This may suggest heavy rail has the greatest potential for uplift, but that it is often not realised in practice. Conversely, heavy rail is the most capital-intensive of the modes included in Table 4, something for which the table does not account. If uplift per unit of capital spent were assessed, light rail and BRT would likely both yield superior results to heavy rail. The wide variations in uplift percentages for all modes suggest policy makers would be unwise to plan for the average uplift without understanding critical sources of variation in realised uplift levels elsewhere.

Table 1. Average value uplift by public transport mode

Mode	Average value uplift (%)	Range (%)	Number of observations
Heavy rail	6.9	-42 to +40	18
Light rail	9.5	-19 to +30	32
Bus rapid transit	9.7	-5 to +32	14

Source: BITRE Information Sheet 69. The table is based on papers by Smith et al, 2015 and Ozdilek, 2011 and the meta studies of Mohammad et al, 2014, McIntosh et al, 2014 and Stokenberga, 2015.

Greater LVU comes from interventions that provide multi-connected new links to the existing public transport network, enhancing the backbone of public transport, compared with new links in a suburban area with less obvious network accessibility gains. Context is important: developing countries exhibit higher LVU from bus-based infrastructure than developed countries, possibly due to the more limited availability of rail-based options. Cities in Australia and North America tend to have more clearly defined and important Central Business Districts than European cities. Improved links to these tend to lead to greater change in accessibility gradients than the more mixed-used environments more common in European cities. Commercial properties also tend to have higher LVU than residential properties (see Table 2).

Table 2. Summary of estimated value uplift for different property types

Property type	Range of property value (HIGH)	Range of property value (LOW)
Single family residential	+32% within 40m of a station	+ 2% within 70m
Apartment	+45% within 410m	+4% within 810m
Office	+120% within 410m	+9% within 1000m
Retail	+167 within 70m	+1% within 160m

Source: Centre for Transit-Oriented Development (CTOD) Capturing the Value of Transit, 2008 as cited by SGS(2015) Innovative funding models for public transport in Australia

Spatially disaggregated models demonstrate significant spatial variation in LVU. While there is wide variation in their results, common conclusions appear to be that:

- Interventions in areas of decline are associated with lower levels of LVU;
- Significant improvements in travel times are needed to achieve observable LVU – an unsurprising result as travel time savings are a core accessibility metric;
- Higher quality investments, such as light rail in dedicated pathways, yield higher LVU.
- LVU is greater where density is higher and where there are more amenities.
- The development or improvement of a network provides LVU due to the network effect (i.e., more widespread accessibility gains result).

Many studies are cross-sectional and cannot address the timing of LVU. Existing longitudinal studies show that LVU does not necessarily occur linearly from the time of project announcement to the commencement of the new service. In some cases, for example, in the Chicago and Washington metros in the USA, LVU was anticipated. That is, LVU was observed at project announcement, or during the building phase of the investment, before the realisation of the accessibility gains. However, additional gains

accrued after service commencement. In other cases, there was no observed LVU until after service commencement. In still other cases, such as in Portland, USA, LVU was anticipated before commencement but subsequently diminished in magnitude. There appears to be no consistency in the timing of LVU, but ignoring the timing of LVU can bias the estimation of its size.

Overall, the various ex-post measures of LVU do not provide a firm basis for linking LVU to LVC for existing properties. This creates problems in developing an evidence-based policy. LVC opportunities seem highly context-specific, and LVU is typically modest in size. Timing is variable and the potential LVU is greatest when the intervention links users to an extensive, efficient network because this yields major accessibility gains. Despite these implementation issues, the practice of LVC has provided significant funding for public transport worldwide. How this has occurred is addressed below.

Instruments of land-value capture

The OECD Compendium (2022) provides a taxonomy of LVC instruments and a worldwide survey of their use. It offers the following definitions of LVC instruments:

- Infrastructure levy: taxes or fees levied on landowners owning or using land where LVU has occurred as a result of government-initiated infrastructure development
- Developer obligations: cash or in-kind contributions to the costs of additional infrastructure or services required due to private development
- Charges for development rights: cash or in-kind contributions levied in exchange for development rights or development potential above a set density baseline
- Land readjustment: the practice of pooling fragmented land parcels for joint development, with owners of the land handing over a proportion of land for public use
- Strategic land management: governments actively buy, develop, sell or lease land to further public needs and recoup value increments generated through public action. This instrument is rarely used in the transport domain.

The Compendium addresses transport, public utilities, public space, public services, and other public infrastructure activities. It does not present the evidence relating to transport investments separately from that for these other sectors.

Transport LVC is well-suited to infrastructure levies because the catchment area is relatively easy to define, so identifying who should pay is relatively easy. Over 50% of the infrastructure levies identified in the OECD Compendium were based on the project cost, and only 23% on the size of the LVU. This is problematic since the LVU may not be proportional to the cost of the project and, if there is a considerable spatial variation in the extent of the LVU, this gives rise to inequity between taxpayers. Infrastructure levies are sometimes called tax-increment financing (TIF) in the transport context. The construction of the Randolph/Washington station in Chicago, USA provides an example. This benefited from $13.5 million in Tax Increment Financing (TIF) funds from local LVU for existing properties and new development (Iacono et al., 2009).

A special assessment is another levy used to finance public transport infrastructure. Special assessments usually impose a one-off tax on affected properties. Typically these one-off taxes are implemented to vary with their distance from the new infrastructure. In the public transport context, this is usually administered through the concept of a public transport benefit district. The rationale for creating a public transport benefit district is that existing properties within the district benefit disproportionally from LVU due to the project, and owners should contribute to the cost of the investment that created this uplift. A special assessment provides a one-off capital source, rather than contributing to ongoing costs.

Another form of infrastructure levy is the transport levy. This usually refers to an ongoing charge on property owners, collected in tandem with other land taxes, such as property rates. These funds are used to accelerate improvements to public transport and associated infrastructure. There are several examples in Australia, including those cited above which partly funded the Gold Coast Light Rail project and the Sunshine Coast Mass Transit Project. A transport levy is not related to specific LVU estimates for a given cohort of properties, as with a Public Transport Benefit District. Instead, it is imposed on the basis that LVU generally accrues when accessibility has improved. A general transport levy can potentially support

multiple transport projects, both large (new infrastructure) and small (bus stop improvements) and provide ongoing revenue support.

A business rate supplement (BRS) is a more specific levy targeting larger non-domestic properties benefiting from the transport investment. Levies may be applied solely to non-domestic properties in recognition of the fact that LVU is typically greater for commercial and retail properties. Such a levy funded around 25 – 30% of the cost of the Crossrail project in London (SGS, 2015). The limiting factors for infrastructure levies are the size of the expected LVU and the acceptance by the potential taxpayers that the LVU exists and is of the claimed size. The business rate supplement (BRS) for Crossrail was agreed between government and business following lobbying by the London Chamber of Commerce to relieve congestion for commuters on the London Underground or face business moving out of the city.

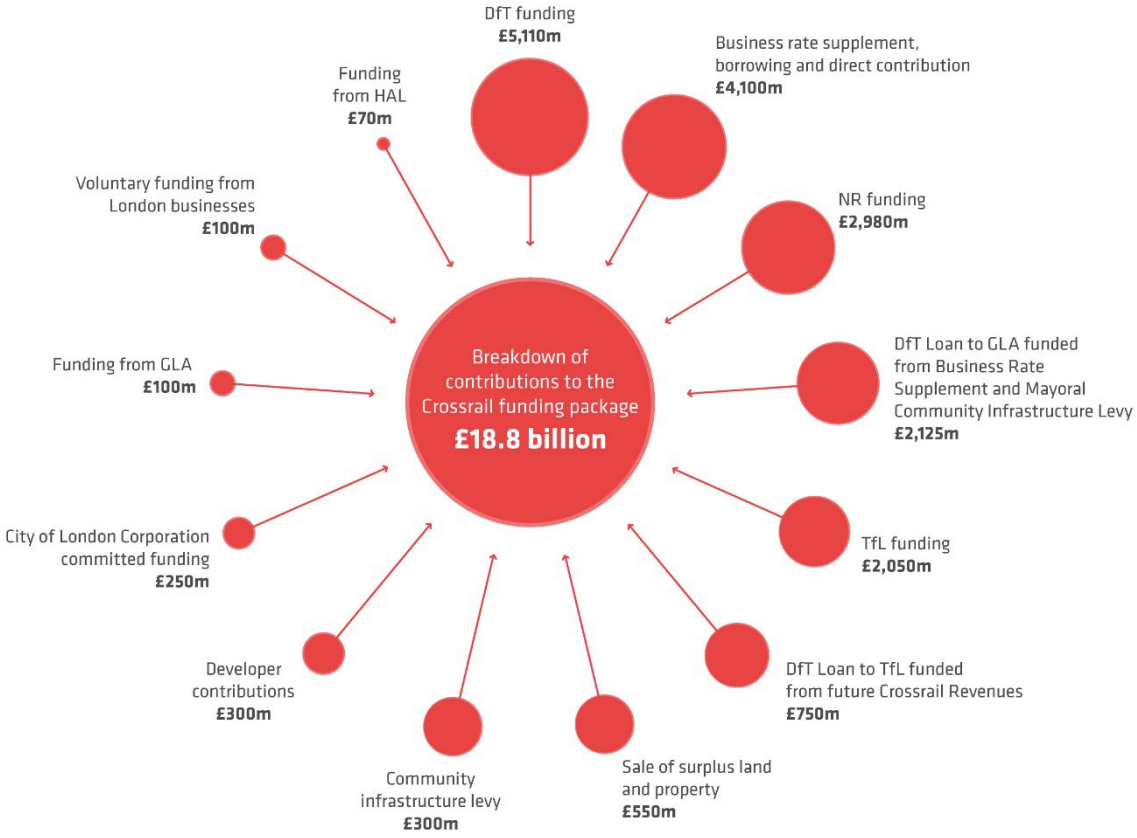
The potential importance of this LVU instrument to project fundability is illustrated by the fact that Crossrail had first appeared on strategic plans for developing London's public transport system in the 1943 County of London Plan, but successive governments were unable to finance the investment. Agreement on the BRS broke the logjam and the national government passed legislation in 2009 to allow local government to levy taxes on non-domestic properties to fund infrastructure.

The Mayor of London, in agreement with the national government and the Chamber of Commerce, introduced an annual BRS from 1st April 2010. This was intended to finance GBP 4.1 billion of the Greater London Authority's contribution to the Crossrail project, then estimated to cost GBP 15.9 billion. The BRS was implemented as a levy of 2% on the rateable value (i.e., the estimated annual rental value) of those non-domestic properties in London with rateable values above a threshold level (initially GBP 55,000, currently GBP 70,000).

The BRS provides an ongoing contribution and is likely to run for between 24 and 30 years, or until borrowing by the Greater London Authority is repaid. The levy rate remained at 2% through 2023, despite increases in the estimated project to GBP 18 billion. Figure 3 shows the overall breakdown of funding contributions to Crossrail.

In April 2012, the Mayor introduced an additional Community Infrastructure planning Levy (CIL) on new property developments in London to help finance Crossrail. This was designed to raise GBP 300 million and was introduced together with other developer obligations for Crossrail that raised a further GBP 300 million. The Mayoral CIL is calculated on net additional floorspace. Rates vary by borough, with three bands according to distance from the centre (Greater London Authority 2016). The rates were increased in 2019.

Figure 3. Breakdown of funding contributions to Crossrail, 2021



Source: Crossrail (2021).

Developer obligations are usually applied to land developments and are fees paid by developers as a condition of gaining approval. These are generally justified by the need to provide a range of infrastructure services to the newly developed land, rather than being tied explicitly to transport or any other specific infrastructure requirement. However, the revenues obtained could plausibly be hypothecated to specific infrastructure providers. Most countries surveyed for the OECD Compendium determined the impact area as being within the development boundaries, with contributions sought for the required infrastructure. A smaller number of countries use a broader definition of impact, sometimes covering a significant part of the urban area. The amount of tax paid is typically determined via a rule-based approach, with negotiated approaches being much less common.

Developer obligations are widely used for public transport infrastructure. Examples include London's Crossrail, described above, and the Grand Paris Express. They can include negotiated in-kind contributions to public infrastructure, such as new local roads or green spaces, rather than contributions necessarily being used specifically to finance new public transport infrastructure. London has continued to add to its developer obligation tools and most recently introduced voluntary contributions to fund enhancements to public transport. The Public Transport Access Level (PTAL) indicator is used to measure connectivity and forms a central part of the Transport Assessment for major new developments. Two models (CAPITAL and ATOS) are used to assess the level of public transport accessibility of the site and access to destinations by

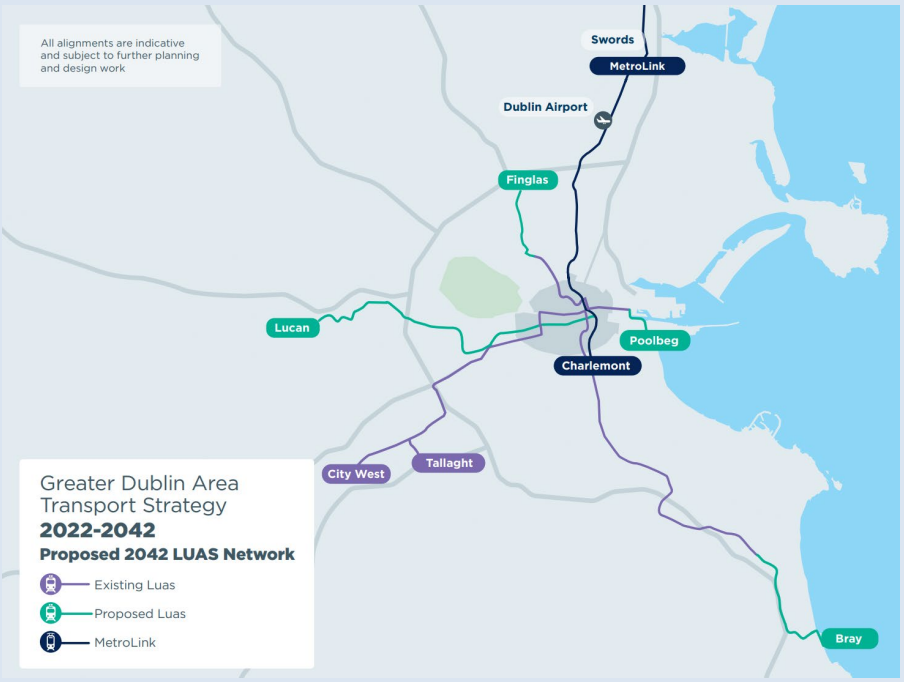
public and active transport modes, respectively. PTALs can identify whether the connectivity of a proposed development is lower than desirable for the development plan's density level (Transport for London, 2010). PTALs can therefore be used to identify the extent of the accessibility improvement required as part of a development. They can thus potentially be used to assess the funding contribution towards transport improvements required from the developer. The Greater London Authority has begun to use this methodology as a means for developers to voluntarily propose contributions sufficient to raise PTAL scores to levels that permit project authorisation. This was the case for the GBP 9 billion Nine Elms redevelopment of the Battersea Power Station site close to the city centre. A loan from central government of £998.9m was made available to the Greater London Council, to be repaid through incremental business rates levied on the Enterprise zone around the development and Developer Contributions from the development, to construct two metro stations and extending the Underground's Northern Line to serve the development.

Box 2 discusses the use of LVC to assist in funding the development of a light-rail network in Dublin, Ireland. As is often the case, various LVC instruments have been adopted, and used in combination, for various individual projects. Notably, the relatively recent adoption of plans to develop several further expansions to the network simultaneously has posed new challenges for the implementation of LVC, which are still being addressed.

Box 2. Land-value capture in Dublin: The Luas light-rail system

Dublin's Luas light-rail system (see Figure 4) began operation in 2004 with the opening of the Green Line between Dublin city centre and the southern suburb of Sandyford, and the Red Line connecting Connolly Station— Ireland's busiest — with Tallaght, a large satellite town to the west. On opening, it was not possible to interchange directly between the two lines, which were located approximately 1.5km apart at their closest point.

Figure 4. Proposed light-rail network for Dublin, 2042



Source: Greater Dublin Area Transport Strategy 2022-2042 (National Transport Authority, 2022).

The system has been expanded progressively, with several LVC mechanisms deployed to contribute funding. The Green Line extension to Bride's Glen, passing through the Cherrywood Strategic Development Zone, was opened in 2010. It incorporated different LVC approaches for directly affected landholders and those in a broader catchment area. It was decided to enter commercial agreements with adjacent landowners, rather than use Compulsory Purchase Orders to obtain necessary land. These included the provision of land for the project at reduced prices and capital contributions towards the construction costs, in recognition of the LVU that would occur. Across the wider catchment area (spanning approximately one kilometre either side of the metro line), a levy of EUR 2 000 for new residential units, EUR 38 per square metre for commercial properties, and EUR 43 per square metre for retail properties was adopted pursuant to the Planning and Development Act 2000 (S49), to be paid over 30 years, with 2-yearly rate reviews.

The Red Line spur from Belgard to Saggart (Luas A1) opened in 2011. A consortium of three private developers with large land holdings that would be served by the extension provided land for the line and constructed the civil elements. The consortium recognised both the LVU of the light rail (and the associated land rezoning) for their holdings and the opportunity to expedite delivery of the scheme by providing private funding.

In 2013, development contributions were levied in respect of the Line C1 extension to Docklands, which opened in 2009. They also applied to land one kilometre either side of the Line and were set at the same rates as for the Green Line extension (above), with a slightly shorter duration of 25 years. A similar approach was taken in respect of the most significant extension to the system, the Luas Cross City extension. This took the Green Line northward through Dublin city centre to the suburb of Broombridge, and enabled passengers to transfer between services in the city centre after opening in 2017. The same contribution rates were adopted, over 30 years. The expected yield from the Luas Cross City levy is EUR 27m. This LVC equates to 23% of the estimated LVU accruing to new developments in the catchment area. It is notionally equal to approximately 7% of the project's capital cost, albeit the EUR 27 million represents the undiscounted value of the contributions over 30 years.

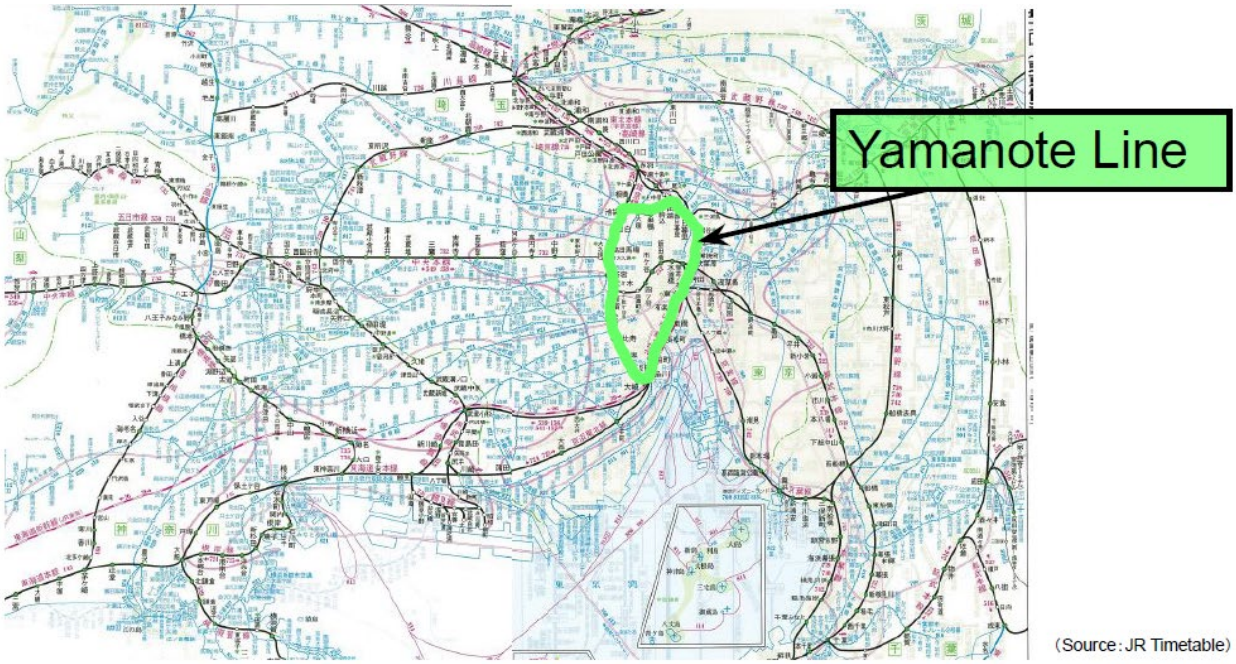
A different approach was taken to the Luas Line B1 extension to Cherrywood. In this case, supplementary development contributions were declared on a per hectare basis, at rates of EUR 250,000 for residential development and EUR 570 000 for commercial development. This differential approach reflected the fact that the Cherrywood extension covers lands on the periphery of the Dublin Metropolitan Area. In contrast, the Docklands and Cross-City extensions served the city centre. In addition, the municipal authority responsible for setting the rates for the Cherrywood extension was not the same as for the two city centre extensions.

Four additional Luas extensions are proposed in the Greater Dublin Area Transport Strategy 2022-2042, as well as the MetroLink light rail line connecting the large northern suburban town of Swords with the city centre via Dublin Airport. Decisions about what form of LVC will be used are yet to be taken. This is primarily because several significant sustainable transport programmes and projects are being developed, with some overlapping catchment areas, particularly on the approaches to the city centre. In this context, a project-by-project approach to LVC is considered potentially undesirable due to equity concerns and because it may negatively affect the ability to capture LVU on later projects. In sum, the principle of a development contribution is well developed but the detail of its future application us yet to be determined.

Source: Department of Transport/National Transport Authority (Ireland).

In some jurisdictions, the transport entity itself becomes involved in property development, both creating demand for the new transport infrastructure and extracting LVU from the development of the land. The "KOBAYASHI-Ichizo Model" followed by Japan's private railways after 1945 is perhaps the most fully developed "integrated development" model. The railways purchased land on and around proposed government rail routes, built their own rail lines, developed the adjacent land, and developed a range of facilities and businesses within the new suburbs, including sporting and leisure facilities and hotels. Figure 5 shows the extent to which private rail investments (the blue lines) underpinned urban development in the hinterland of the main Japan Rail lines.

Figure 5. Integrated development in Japan: the KOBAYASHI-Ichizo Model



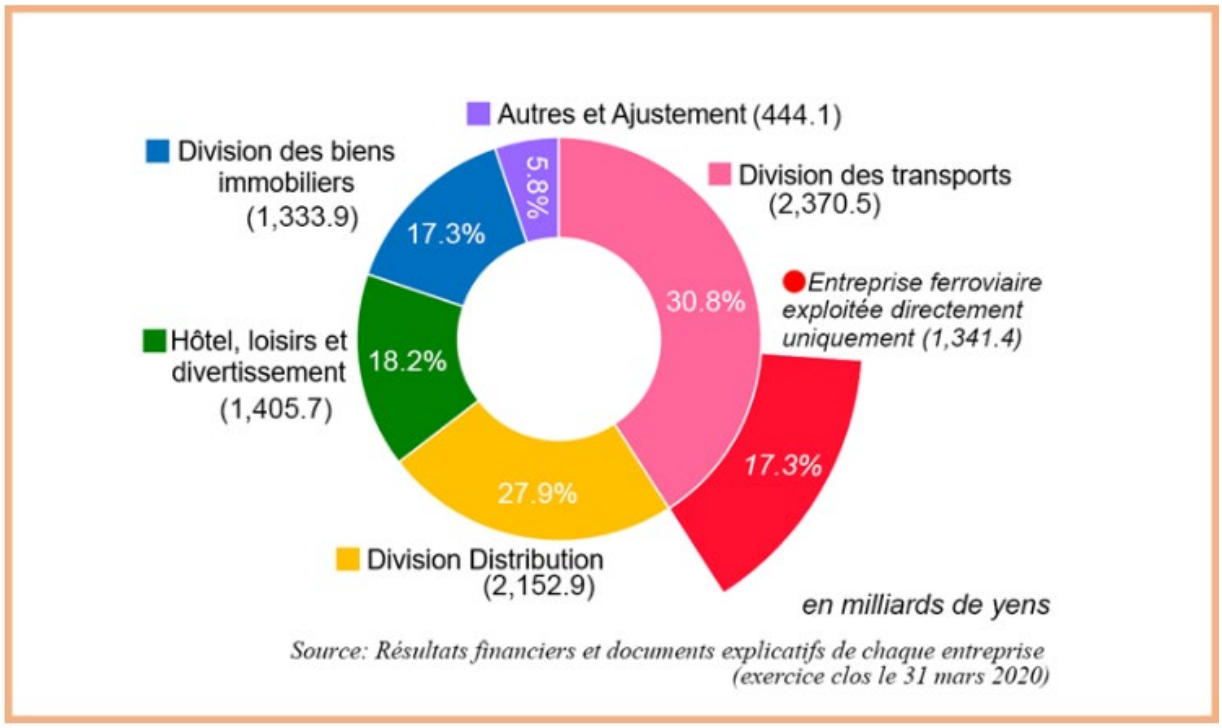
Source: Kurosaki (2023).

This approach provided initial funding for infrastructure and ongoing funds that could be used for revenue support. Kurosaki (2023) argues that the success of this model relied on three key features of the operating environment: rapid population growth, similarly rapid urbanization, and poor road transport infrastructure. This led to rapidly rising land prices, particularly for land served by rail transport, and meant that developing land and businesses to serve the new suburbs was highly profitable.

However, the changing environment, including slowing population growth from the 1970s onward and rapidly increasing motorisation, meant the risks to private rail companies of continuing with the Kobayashi model became prohibitive. In response, the Japanese government passed an Integrated Development Law. The law was intended to enable the continuation of the integrated approach to land and rail transport development by allowing regional governments to take the leading role. This involves public authorities purchasing land parcels before rezoning, with a land readjustment plan subsequently being adopted. The resale of some land parcels helps fund the development of public facilities. This model was adopted successfully for the development of the Tsukuba Line to the Tskuba new town development 60km northeast of Tokyo. The relevant municipal governments are shareholders in the rail entity and lead both land development and rail projects. They receive ongoing income from both dividends from the rail entity and increases in land tax. The latter can be regarded as a form of LVC (Kurosaki 2023).

The extent to which Japan's private rail companies have relied on non-rail investments is highlighted in Figure 6. This shows that, despite the KOBAYASHI-Ichizo Model being long superseded by development following the Integrated Development Law, non-transport sources continued to account for almost 70% of the revenues of the private rail sector, as of 2020.

Figure 6. Revenue sources for Japanese private rail operators



Note: Categories are property (blue), hotels, leisure and entertainment (green), distribution (yellow), transport (pink) other/adjustments (purple), and directly run by rail enterprise only (red).

Source: Minami (2023). Data drawn from company Annual Reports.

Hong Kong has also systematically adopted a "Rail Plus Property Development Model" as its key LVC mechanism. In this model, the government and MTR (the Metro authority) jointly identify property development sites in and around future stations as part of the development of a master plan for a new metro extension. MTR then obtains a 50 year lease for the development rights for land adjacent to stations, plus air rights over stations, from government. The lease value is based on the "pre-development" value of the land. The MTR then tenders these development rights to private developers, with the resulting development agreements containing profit sharing formulae. The private developers usually pay all development costs, including the land premium, and bear the construction and commercialization risks and costs related to the residential and commercial properties. In 2023, this model underpins the development of several proposed new transport infrastructure projects and is also used for major road projects and public transport developments.

In theory, this model allows the capture of all the LVU, albeit the MTR and private developers share the LVU and development profits. It also provides for maintenance and infrastructure improvements into the long term due to the continuing revenue flows that form part of the model. The model is often cited as a benchmark for LVC. For example, Aveline-Dubach & Blandeau (2019) refer to the "outstanding efficiency

of the R + P [Rail plus Property] model". However, similarly to the Kobayashi model, they attribute its success to Hong Kong's "unique conditions", notably:

- a large public transport ridership, due to very high demographic density and public policies restricting development to major railway transport corridors
- a regime of public ownership, allowing the supply of a large amount of land to the MTRC at below-market price
- dramatic growth in real estate values over virtually the whole operational period of R+P
- well-established procedures and a skilled transit agency with considerable experience in urban planning and integrated railway-property development.

The authors also note that several fundamental changes have meant that the model pursued has changed fundamentally. In particular, these changes include the conversion of MRTC to a listed company, with associated transparency and accountability obligations, and the major political and economic changes consequent on the reversion of Hong Kong to Chinese control. The current model is characterized as a "management based" model, in which MTRC focuses on managing existing property assets, rather than new developments.

A critical insight is that, while Hong Kong and Japan have been cited as exemplars of successful LVC, the premia accrued under these models do not solely represent conventional LVU, as discussed above. Rather, the value uplift comes partly from land development per se. The government of Hong Kong has a monopoly on land ownership and severely restricts development. Transferring land to the transport authority at a below market price and enabling it to develop it effectively creates a value increase due to removing a regulatory restriction on land use and enables the transport authority to capture that value increase.

Thus, the LVU comes from some combination of removing the regulatory restriction previously applied to land use, developing the land, and the increased accessibility due to the transport infrastructure investment. This is apparent in the research of Verougstraete & Zeng (2014) on the size of LVU observed in Hong Kong – measured traditionally as the "value premium [that] result from public investments". This work reports similar results to the international average cited above. "…*research indicates that housing price premiums in Hong Kong are in the range of 5 to 17% for units in proximity to a railway*.", albeit the authors find the premium can exceed 30% if transit-oriented design is used.

No research is available on the relative importance of the three factors cited above in explaining the total LVU. This is unsurprising since the transport authority's ability to capture the total amount accruing from all these factors means that it is likely to have limited interest in determining their respective significance. However, from a conceptual viewpoint, it is important to note that the "observed" LVU in such a context is not entirely – or perhaps even primarily – a product of the accessibility improvement following from the transport infrastructure investment. The multiple sources of LVU involved in this context make it unsurprising that the reported levels of LVC are sometimes high. However, maintaining tight monopoly control over land use is not an efficient means of generating public revenue, given the opportunity costs involved.

Transit-oriented development (TOD)

The potential for using a TOD approach to increase the proportionate value of LVU is highlighted by Cervero and Murakami (2009). The authors' study of standard "rail plus property" developments in Hong Kong found that LVU were sometimes as low as 5% and did not exceed 17%. However, "If the R+P projects

had a distinctively transit-oriented design, reflected by nearby retail shops, high quality pedestrian corridors and open space, the premiums exceeded 30 per cent." That is, adopting key TOD features approximately doubled LVU premia. The key factors cited by the authors imply a more sophisticated integration of transport and land use planning, focused on the broader liveability of the urban spaces created.

TOD effectively adopts this principle of integrating transport and land use planning in developing major new, or upgraded, transit infrastructure. However, it does not necessarily imply the transit authority undertaking the non-transit development. The OECD argues that flexible regulatory approaches near transit stations give developers greater opportunity to adopt more complex and integrated approaches to development, highlighting the potential of mixed-use developments. TOD implies greater urban densification, with increased floor area ratios being encouraged in transit station precincts. This, in turn, increases LVU. It also contributes to more sustainable development patterns, by ensuring development is clustered around public transport hubs and thus maximizing modal shift potential. It can thus increase revenues for transit authorities by attracting more users and increasing user fees. The OECD thus recommends that governments Enable intensive transit-oriented development around stations (OECD 2022). However, a key factor is ensuring an adequate portion of the LVU created is directed to public use through effective LVC strategies.

Equity issues in implementing land-value capture

LVC is based on the principle of capturing some or all of the added value resulting from public interventions that enhance the accessibility of land from those who benefit from it. Whether the LVC approach is efficient and sustainable are critical concerns, but it is also important to consider the 'fairness' of LVC instruments.

Equity can be considered from a horizontal or vertical equity viewpoint. In general, horizontal equity is achieved if each taxpayer pays an equal dollar amount of tax whereas vertical equity requires those with a greater ability to pay, pay more. In this case, a LVC tax regime fails the vertical equity test – i.e. is regressive – because the tax paid by lower-income groups will represent a higher proportion of their income than that paid by higher-income groups if a uniform tax is applied. In contrast, a tax based on ability to pay, for example, treating different socio-demographic groups differently, will be progressive as higher-income taxpayers contribute more than lower-income taxpayers. However, in any specific geographical context, the size of the capital gains accrued is likely to be only loosely correlated with income levels, if at all. This suggests that an ad valorem tax, whereby each landowner pays the same percentage of the capital gain, perhaps in the form of a rates surcharge, may best meet the equity criterion, although such a levy could create problems for landowners who are asset-rich but cash poor but this can be addressed through staged or deferred payment arrangements. Importantly, any levy that recovers less than 100% of the LVU still leaves the landowner with a windfall gain. Perhaps for this reason, the government of New South Wales (Australia) has moved away from the rhetoric of LVC, replacing it with 'value sharing.'

Infrastructure levies, including TIF, special assessments, and transport levies, tend to be applied uniformly on all taxpayers within a given beneficiary group. They thus achieve horizontal equity, but are arguably regressive. The other LVC instruments (developer obligations, charges for development rights, land readjustment, and strategic land management) are more likely to be progressive since the market determines their incidence. This is particularly so as commercial entities tend to have higher incomes and a higher ability to pay.

Other equity issues arise because LVU does not occur uniformly across areas, with lower-income neighbourhoods yielding lower percentage gains via LVU than higher-income areas. Increasingly, equity considerations influence decisions on the location and provision of transport infrastructure, where equity is considered from the perspective of social justice and fairness. However, governments pursuing such "levelling up" policies will likely face a trade-off between policy objectives due to the lower average LVU yielded in low-income areas. That is, there is an equity gain and an efficiency cost.

This gives rise to an evaluation of spatial equity in implementing LVC. Most, if not all, of the instruments described above require the identification of specific boundaries for applying the LVC. Property owners or users outside these boundaries will still benefit from the public transport improvement (albeit to a lesser extent), but will do so without paying an associated cost, unlike owners or users inside the boundary. There will also be contexts in which multiple LVC schemes are in place, and taxpayers located in an area of overlapping LVC districts may be subject to more than one tax.

Challenges in implementing land-value capture

Experience with LVC varies considerably between countries. The survey conducted as part of the evidence base for the OECD Compendium found all countries, except Uganda, used LVC at least occasionally. However, this use may not relate specifically to the public transport domain. Low- and lower-middle-income countries typically use LVC less than their developed country counterparts. This may partly reflect capacity requirements, as effectively implementing LVC mechanisms requires significant government capacities.

The challenges associated with LVC implementation broadly fall into two categories: how to identify who should pay and how to set the level of tax to be paid.

The use of LVC requires a legislative framework to permit it and a governance framework to support it. The OECD Compendium identifies this as a critical barrier to LVC policies in practice. Identifying potential taxpayers requires good land registry information and quality cadastres that accurately (and without corruption) record quantity, value, and ownership characteristics. Identification of taxpayers is particularly challenging for middle and low-income countries. It is also necessary to have the administrative capacity, typically at the local government level, to implement LVC effectively.

The OECD Compendium identifies owners' resistance as one of the more common challenges to LVC, irrespective of country income level. A lack of political will can pose a significant challenge for LVC implementation in all countries, even if the idea that beneficiaries should pay is uncontroversial.

The empirical evidence on the size of LVU identifies quite different uplift levels by mode, although this may partly be a product of the methods used. Studies also show LVU varies over space. Perhaps most importantly, the evidence is based on ex-post evidence whereas, to be useful for LVC, some idea of the potential LVU needs to be ascertained ex-ante. These factors explain why LVC schemes in transport are more likely to be based on project cost rather than potential LVU. The OECD Compendium suggests that, in high-income countries, the imposition of levels of tax that are too high can compromise the acceptability of LVC, hence the ability to deploy it more widely.

While LVC has been used to help finance infrastructure projects, there is little evidence of its use to provide ongoing revenue for public transport operations. Of the instruments discussed here, a transport levy or a dedicated rates surcharge (where rates are usually levied on the property's value, thus constituting an ad valorem tax) are likely to be the only mechanisms suitable for providing such ongoing revenue support.

Conclusions

Public transport is vital to cities' sustainability, but providing new transport links is expensive, and governments increasingly find funding investments and subsidising operating costs challenging. Unsurprisingly, the recent OECD LVC Compendium (2022) found that more countries were now looking at how LVU can be captured to help fund new infrastructure. LVC is a potentially important funding source for new public transport infrastructure. However, the highly context and mode-specific character of LVU complicates its practical implementation. LVC has made substantial contributions to the funding of some major projects: for example, it funded around 30% of the cost of Crossrail, while a prospective analysis suggests that use of similar instruments could contribute 43% of the funding needs of the Crossrail 2 proposal (PwC 2014), However, research suggests that its potential contribution will vary substantially between projects and will usually be somewhat lower. This is partly because, even where major projects yield significant LVU, there may be limited potential to capture these sums.

To maximise effective LVC, it is common to levy more than one type of LVC charge. For example, the Crossrail project was partly funded by five LVC-related sources, including a business rate supplement, a smaller community tax, and the sale of surplus land (SGS, 2015). Adopting multiple charges can better match benefits received, and contributions made, across different groups, facilitating the capture of a higher proportion of the overall LVU. Nonetheless, significant challenges remain. Indeed, Buck (2017) concluded that only around 10% of the estimated LVU of GBP 5.5 billion from the Crossrail project was captured by the government, with 90% retained by private landowners as windfall gains.

Seeking LVC through business rate supplements is usually more politically acceptable than levying charges on residential rates. Where there is business resistance to business rate supplements or other obligatory contributions, the use of voluntary Developer Contributions, mediated through the utilisation of accessibility measures such as PTAL can be another option for effectively achieving LVC.

Even if explicit LVC charges are not adopted, an infrastructure project that generates LVU will inevitably see some of this captured over time if land-based taxes reflect property prices. This “LVC by stealth” can be significant, but may not help to fund new infrastructure projects, as the level of government responsible for implementing the land-based tax may not be the same as that developing the project. Japan’s Kobayashi model avoided this, since the development and the transport project were integrated, with uplift necessarily flowing to the infrastructure developer.

The opportunities for implementing one or more forms of LVC are considerable. The most notable examples of successful LVC are in countries that exercise strong control over land use planning. LVU – and hence potential LVC - are especially high where land supply is tightly constrained, as in the case of Hong Kong. However, strong constraints on land supply imply large welfare costs to the wider society. Thus, a modest contribution to project funding from LVC should not necessarily be seen as an indication of failure, but as a useful addition to the funding envelope for major transport project. Successfully employing LVC to contribute to funding new infrastructure implies capturing a portion of the LVU accruing both to existing properties and new developments within the project’s catchment.

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