New Approaches to Strategic Urban Transport Assessment

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New approaches to strategic urban transport assessment

Chris A. Hale*

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Most transport assessment is generally based on incremental analysis of individual projects with pre-existing planning and political support. Unfortunately, this approach to transport decision-making is unlikely to result in cities being able to meet a comprehensive range of desired urban objectives on a broader-scale over time. Project analysis is generally based on benefit-cost analysis and intermediate metrics (vehicle kilometres travelled, time savings and road user costs). But additional metrics and attributes may be needed to assess goals and performance relating to broader transport outcomes in a metropolitan region and its society, environment and economy. ‘Higher level’ strategic urban transport analysis offers the opportunity of a more strategic platform for metropolitan region-wide transport policy discussion, assessment, planning and network improvements. It may also assist to demonstrate mass transit, walking and cycling’s unique opportunities to contribute to better city futures through economic development, sustainability, and lifestyle improvements. In the realm of mass transit, improvements can be delivered by targeted changes in policy, infrastructure and network enhancements, improved service characteristics, better network utilisation, and stronger system financial performance. Performance of passenger rail networks, corridors and proposals is a substantial research focus, but improvements to rail over time should ultimately be reflected in a wider set of outcomes and measurables. This paper reviews established literature and research on transport analysis approaches, to identify key performance indicators at an urban or metropolitan level, metrics on the utilisation and effectiveness of rail mass transit, accessibility indicators, and a handful of broader social, economic and environmental performance indicators.

Keywords: strategic assessment; urban transport; transport planning

The context for next-generation transport performance assessment

Many of the factors that contributed to vehicle travel growth have peaked. It is unlikely that per capita vehicle ownership, automobile mode split, the amount of time people devote to driving, or average vehicle traffic speeds will increase significantly in the future. (Litman, 2010, p. 28)

Transport is changing, so assessment must change

It is suggested that much of the working method currently and recently in play for transport planning in Australasia or North America was based on a series of assumptions and frames of reference that appear increasingly open to re-interpretation, as context and circumstance changes. These earlier ways of approaching transport exercises are evident in both planning methods, and in the heavy emphasis on road building rather than rail or other transit as a preferred project type (Litman, 2010). But potential for change is also currently in evidence through a range of strategic-level planning and policy documents for major cities (e.g. NSW, 2010, p. 14; MTC, 2009; TfL, 2009; TMR, 2010; City of Munich, 2005). The ‘predict and provide’ approach’s role in project choice has been discussed at length, but evaluation methods (and the public discourse on transport and urban planning choices for that matter) has only seen marginal change into the 21st century (Banister, 2002). This paper is not the appropriate forum for re-listing any failings of ‘predict-and-provide’, but a brief summary of current strategic challenges and changing circumstances is probably necessary. To be effective, it is suggested that new transport initiatives must increasingly seek to:

- address realities of saturation and possible declines in car usage per capita (Litman, 2010; MTC, 2009);
- deliver accessibility-based goals rather than mobility-based goals (Guers and van Wee 2004);

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take account of limited government resources for transport (or other) infrastructure and services (MTC, 2009). This means that economic efficiency, social benefit and environmental improvement must be optimised through transport investment decisions;

- implement an integrated land use/transport concept (NSW, 2010; TCRP, 2004; ASBEC, 2010; Cervero and Arrington, 2008), rather than continually discussing its potential implementation;

- understand that peak period rail capacity appears to be strained in many major cities (e.g. TFL, 2009, p. 12), and that overly peak-loaded operational and strategic paradigms are actually hampering system utilisation and financial performance (Hale and Charles, 2009a, 2009b);

- engage in ‘passenger-growth’ and ‘customerservice oriented’ postures for rail transit in particular (Hemily, 2004; Litman, 2010; Hale and Charles, 2009a, 2010; Walker, 2008);

- finally recognise the inherent differences between rail transit and bus-based options, rather than unrealistically treating them as ‘competing’ – a posture that is common in Australasia and North America, but which would probably be considered curious to the more successful European or Asian transport mindset (Litman, 2010);

- utilise public transport as a highly-effective congestion-mitigation strategy (Nelson et al., 2007; Cullinane, 2003; MTC, 2009)

- return fundamental questions such as transit travel time and system speed to their rightful place as key issues in accessibility, performance evaluation and project planning.

These issues and more appear now to be at the heart of new efforts for more effective transport policy formulation, project analysis, level-of-service improvements and economic outcomes into the future.

**Working at different scales**

In any next-generational effort based on previous starting points (e.g. Newman and Kenworthy, 1999; Mees, 2010), analysis and outcomes at both the localised scale and the broader regional scale must receive a clearer distinction on the one hand, and more effective inter-relationship on the other (Hughes et al. 2003; Hemily 2004, p. 30). This combination of distinction and working integration between scales may appear at first slightly counter-intuitive, but it is an intellectual and functional ‘step forward’ that must be carried through in analysis tools, projects, and ultimately in the attainment of better transport outcomes at different spatial scales over time.

The regional or metropolitan scale is quite rightly the strategic starting point as we seek to understand cities and perhaps how they compare to each other (Nelson et al., 2007). It is also the appropriate scale at which to work as we analyse the performance of transport systems, and is the key strategic conceptual level for initial formulation of new policy directions (Cameron et al., 2004; Cullinane, 2003). But at this scale, we still tend to analyse from a limited and, at times, poorly chosen selection of key metrics and indicators. An effective analysis tool must include all metrics that are key indicators, eliminate metrics that lack informative power, and distinguish and choose between different metrics that cover similar phenomenon in alternative ways. There is a balance between too much and too little information that must be achieved in order to assist decision-makers and industry to understand their city or metropolitan area in transport-related terms. We must also be willing to adopt qualitative evaluation and analysis frames as necessary – particularly regarding elusive concepts such as networking and system configuration (Nelson et al., 2007).

At the more localised level, we may seek to understand a corridor or link that is under analysis or being proposed (Vuk, 2005). We also look to the more ‘micro’ scale of the station area or precinct (ULI, 2010; Cervero and Arrington, 2008; Semler and Hale, 2010). At these levels, many metrics apply that are similar or related to those at the regional scale, while other entirely new metrics and analysis viewpoints emerge. Exploration of these links and relationships is needed.

When working between different scales we need to understand how a particular transit initiative, corridor upgrade, or TOD exercise (see Cervero and Arrington, 2008) contributes and relates to outcomes at the larger scale (Vuk, 2005). It appears that analysts need to become increasingly willing to work and adapt between the various urban scales in parallel (Hughes et al., 2003).

**Strategic versus incremental changes**

A significant question for this research effort is:

How do we define a strategically important transport initiative or project, as opposed to actions that are only incremental in their value and contribution?

While the researcher is not yet 100% certain on exactly which metrics might be required to answer this question, some level of clarity is beginning to emerge.
In simple terms, it appears we can assume that an initiative is of ‘strategic’ value if it contributes to substantial positive change on key indicators (Guers and van Wee, 2004). To provide one familiar example – the metric of mode share operates at both a localised and a metropolitan scale. If a particular transport improvement or initiative appears to deliver significant shifts in mode share at a localised level, we can probably safely say that it is a strategically important initiative at that scale (Vuk, 2005; Guers and van Wee, 2004). If an initiative does not substantially improve mode share indicators, then it is probably fair to categorise this as an ‘incremental’ or ‘basic’ improvement, rather than a strategic one. If a corridor or link-based improvement achieves noteworthy mode share shift at the urban and metropolitan scale, then it can probably be classified as a truly strategically important initiative at that scale. Transport for London discusses the Crossrail project in these terms (TfL, 2009). Mode share is of course only one indicator, albeit important (NSW, 2010; Knowles, 2007; Cervero and Arrington, 2008), and we need to identify other indicators or metrics that can also assist us in distinguishing between the relative strategic importance, or unimportance of particular transport options.

Remaining at the vital metropolitan scale, we might then begin to speculate about which kind of options and interventions are more able to deliver substantial and hence strategically important improvements to overall urban transport outcomes (Vuk, 2005; Knowles 2007). In doing so, we are likely to return to important attributes of different transport options or modes that are also, thankfully, amenable to metric analysis. Part of the motivation for this next-generational step is an impression that recent transport evaluation and planning has often been somewhat unfavourably disposed toward bold and genuinely ‘strategic’ initiatives.

**Performance metrics make a comeback**

Using performance metrics allows us to assess current and projected trends, and affords us the opportunity to change our course should our analyses foretell trends that take us in the opposite direction from where we want to be . . . (MTC, 2009; p. 21)

Taking the choice between different transport modes as one area of potential interest, we can foresee that increasing employment of effective metric analysis to different modal options in the same corridor will tend to draw out some of the ‘classic’ attributes of these modes that for one reason or another appear to have fallen from favour in evaluation exercises of recent times.

Performance metrics such as speed and capacity are obvious and essential on the one hand (Litman, 2009; TCRP, 2003), but at times have fallen out of the analysis toolkit – especially at the mercy of other metrics such as ‘system cost’ or ‘project cost’ (Litman, 2009). While no one would deny the importance of project cost, we might dare to suggest that cost of itself is not the only useful transport metric. At the very least, benefit/cost must be considered.

Equally, the performance characteristics of different modal options as they relate to the potential to deliver other measurable outcomes (such as mode shift, and reductions in auto vehicle kilometres travelled) are also clearly of high importance (Cervero and Arrington, 2008). Travel time, transit line capacity, and other considerations need to be analysed with regard to different mode choice options in major transport investment scenarios, along with basics such as proposed service hours and frequencies (Cullinane, 2003; Cameron et al., 2004; Hemily, 2004; TCRP, 2003; Vuchic, 2006). Broad-based measures of accessibility should also be engaged with, particularly to describe the accessibility improvements delivered by alternative policy directions or project interventions (Guers and van Wee, 2004).

It appears that the days of ‘lowest-cost option’ as the only transport investment or planning criteria are numbered – particularly at a time when capacity is returning to the forefront of public transport challenges in Australasian and other cities (Litman, 2009; Loader and Stanley, 2009; TfL, 2009).

**Passenger market-driven transit or a ‘social support’ role?**

. . . there are economies of scale to transit investment, particularly for rail, where right-of-way and capital requirements are relatively intensive to the volume of passengers. (Nelson et al., 2007, p. 233)

We also appear set to re-appraise some of the other assumptions of public transport planning in Australasia (or the USA, and elsewhere for that matter) in major urban areas. Of particular importance is the very assumption and orientation of transit as ‘just a safety net for people who can’t afford to drive’. This assumption appears to be failing rapidly, but the mindset and its problematic role in analysis and planning seems to retain a grip (for discussion, see Walker, 2008; Hemily, 2004). Increasingly, we should be prepared to distinguish clearly between passenger growth-based approaches to public transport on the one hand, and the social support-oriented role of transit on the other (to paraphrase from Walker, 2008). The social support role should generally
be either a sub-set of transit’s overall role (i.e. travel by concession holders), or a distinct set of activities (such as paratransit or demand-responsive options) (Hemily, 2004). Patronage-growth oriented approaches are something quite different, and perhaps under-emphasised.

The typical measure of a patronage goal is patronage per unit of cost, e.g. passengers/km or passengers/h. Where fare revenue is relatively constant per passenger, fare revenue per passenger (high) or subsidy per passenger (low) can also be expressed as achievements toward a patronage goal. (Walker, 2008, p. 237)

If we begin to focus on distinguishing more clearly between passenger-growth goals and social support or coverage goals, greater opportunities seem to open for using true mass transit, primarily rail, as a strategic high-impact anchor for achieving mode share shifts and transport outcomes that are sustainable in both environmental and economic terms, while also offering positive social impacts. When we separate pure social support decisions for transit (on paratransit and/or bus coverage in ex-urban locations) from true mass transit planning, we seem to open up important opportunities to proactively pursue ridership, revenue, cost recovery and cost effectiveness in rail-anchored transit investment and management (Walker, 2008; Vuchic, 2006; Nelson et al., 2007; Hale and Charles, 2009a).

Clearly, rail is costly in terms of sunk investment – and rational, effective management of this scarce resource should always be oriented to some form of ridership-maximisation strategy (Hemily, 2004; Vuchic, 2006; Walker, 2008). To put the issue another way – while it is probably reasonable to propose using bus-based transit for social intervention to improve localised accessibility (Loader and Stanley, 2009), planning for rail with this mindset leads to poor financial outcomes. We might remind ourselves that rail investment and management should always be investment-driven and passenger market-driven precisely because of its cost and capacity (Vuchic, 2006). If the aim is to intervene and provide basic levels of accessibility to particular locations for equity reasons, then bus-based systems provide this option in a cost-optimal manner (hence providing an effective use of social support resources) (Loader and Stanley, 2009; Nelson et al., 2007; Walker, 2008). This does not mean that the development and enhancement of urban or corridor-level passenger rail can be held captive to a mindset that suggests all transit must automatically be heavily subsidised by taxpayers (other than perhaps for concession travellers). To do so would only hold back our rail systems from achieving their full potential, and restrict our willingness and ability to use rail for strategic urban-scale interventions (Hemily, 2004; Walker, 2008).

At this stage, the research avoids directly addressing questions around the ‘weighting’ of units of analysis by relative importance, and instead focuses on the initial identification of suitable metrics and units of analysis, which is felt to be a valuable step in its own right. Weighting is considered to be a problematic and sometimes contentious option for assessments, and consensus has not yet fully formed that a weighted analysis is better than a non-weighted version. In a practical sense, it is also suggested that organizations involved in assessing transport proposals will generally weight according to their own criteria, and opportunities for a contribution to that process from researchers are possibly limited.

**Summary of themes and concepts inviting new research**

The key issues here are the clarity with which we face these difficult questions and trade-offs, and the effectiveness of our analysis toolkit for measuring transport performance, goals, and options. Most likely, greater clarity regarding strategic options will increasingly lead us in the direction of seeing genuine mass transit as an effective tool toward achieving quality transport outcomes at both the localised and metropolitan scale. It will also help us to stop seeing public transport entirely from a social-support mindset. Some may argue that using mass transit as a tool for achieving better sustainability and accessibility outcomes on an urban scale will be ‘impossible’, because of the inherent hostility of the low-density Australasian and North American suburban landscape toward genuine mass transit. But the recent counter-argument from Mees (2009, 2010) is worth following. We also remind ourselves that we must be willing and able to integrate and deliver effective land use responses at the same time as we employ mass transit investment (Cervero and Arrington, 2008; ASBEC, 2010; TCRP, 2004; Nelson-Nygaard, 2006; MTC, 2005; Hale, 2009; Hale and Charles, 2010).

With better analysis we have the opportunity to move from the gross generalization that ‘all Australasian cities are low density’ (to paraphrase), toward a level of clarity that allows us to understand the varied densities of our cities – in particular the density of the CBD and inner-city, the pockets and clusters of transit-amenability at traditional activity centres, and the new promise of locations where targeted smart growth is matched effectively with new transit investments and upgrades (Cervero and Arrington 2008). We can also envisage a range of network development...
opportunities that are not entirely constrained by existing densities as the only issue (Mees, 2010).

The fact is that, almost two centuries after the first train ran, railways are still a means of transport with major potential, and it is renewal of the railways which is the key to achieving modal rebalance. (EC, 2001, p. 26)

Evaluation metrics for consideration

Some meaningful metrics at the metropolitan scale

Through this research process, we are seeking broadly to identify the categories of metric analysis that help us understand urban transport performance and change at various scales. At this stage, the metrics are coming from a review of established sources and literature – and further phases of research should confirm their validity and assist the selection of actual metrics for use – through stakeholder feedback research, and through ‘testing’ by application to real scenarios. Again, any in-depth engagement with the idea of ‘weighting’ the units-of-analysis should be considered out of scope at this stage.

Category 1. Metropolitan multimodal travel and transport characteristics

<table>
<thead>
<tr>
<th>Potential metric/indicator</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode share split</td>
<td>Classic leading indicator addressing the balance of transport trips between different modes. Very informative.</td>
</tr>
<tr>
<td>Sustainable transport usage</td>
<td>Transit ridership; walking trips; cycling trips Annual, weekday, % growth last 5 years.</td>
</tr>
<tr>
<td>Vehicle km per capita</td>
<td>Absolute and annual growth. An insight into levels of motorisation and distances travelled in the average motorised journey.</td>
</tr>
<tr>
<td>Household transport expenditure</td>
<td>As proportion of GRP, and per average household.</td>
</tr>
<tr>
<td>Daily commute time</td>
<td>As an averaged figure. Indication of the time-related travel burden in the community.</td>
</tr>
<tr>
<td>Mode share splits for journey types</td>
<td>Work trips; CBD trips; non-work trips; education-related trips; shopping trips. Effectiveness of sustainable transport at capturing ‘natural’ or latent levels of demand for journeys that are inherently transit-friendly, as well as performance in capturing trip types that are ‘traditionally’ not well catered-to by sustainable modes.</td>
</tr>
</tbody>
</table>

Trip generation rate

Per capita and by household. An indicator of the latent demand for all transport, prior to mode share allocation. Must fully account for walking and cycling trips – which are sometimes under-estimated.

Transport capital investment

By mode, and further analysis per capita. Averaged-out over 5 to 10 years perhaps.

Per capita vehicle ownership

A basic indicator of sunken allocations toward car ownership, hence use.

Fuel taxes

Indicates both the potential tax base for transport-related uses, and the extent to which fuel pricing is actively used as a demand management lever.

Yearly car ownership taxes

As above. As percentage GRP per capita or per vehicle.

Average travel speeds by mode (transit/car)

Strong indicator of the relative level-of-service and competitiveness of different modes.

Length dedicated protected bike paths

Could be measured per capita. Indicator of the current ability to cater effectively to travel by this efficient non-motorised mode.

Category 2. Mass transit system indicators and metrics

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating ratio</td>
<td>Leading indicator of system efficiency and financial performance. Also tends to reflect management effectiveness and related considerations.</td>
</tr>
<tr>
<td>Daily system patronage</td>
<td>Overall indicator of size of mass transit task.</td>
</tr>
<tr>
<td>Daily offered capacity</td>
<td>Indicator of system’s ability to meet current mass transit task and also to cater for inherent load variability.</td>
</tr>
<tr>
<td>Rail system length</td>
<td>By track length and number of stations. Indicates physical scale of system. Can also be measured on a per-capita basis and/or per daily passenger.</td>
</tr>
<tr>
<td>System networking</td>
<td>No clear metric exists – although ‘rate of transit trips involving transfer’ might be workable. Support for the importance of this element is strong. Worth pursuing further.</td>
</tr>
</tbody>
</table>
### Category 3. Land use

<table>
<thead>
<tr>
<th>Metric</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak/off-peak ratio</td>
<td>Measures system utilisation and the 'peakedness' of a mass transit system by proportion of trips during peak period. Can be somewhat 'flexible' as an indicator, because the definition of peak period is itself varied between systems/cities.</td>
</tr>
<tr>
<td>Cost per passenger served</td>
<td>Highly revealing metric. Appears to be more reliable than other similar indicators (see below – cost per passenger km), which tend to 'adjust-out' some of the inefficiencies and problems of network under-utilisation.</td>
</tr>
<tr>
<td>Average peak period passenger loadings</td>
<td>As percentage of seated capacity. Indicates level of crowding and comfort on the system. Also the ability to attract and cater to new passengers. Can also indicate system reliability through available 'slack'.</td>
</tr>
<tr>
<td>Rail station access mode splits (system-wide)</td>
<td>Car-based; walking; cycling; transit transfer. Measured initially as a system average. Indicates the type of facilities and infrastructure required to cater effectively for transit travel. Also tends to indicate whether the system is peak-oriented, with P&amp;R dominated systems tending to cater more to CBD trips.</td>
</tr>
<tr>
<td>Annual capital investment</td>
<td>Per km track and per capita. Can benchmark whether capital investment rates are sufficient (although recognising that different alignment types affect investment cost).</td>
</tr>
<tr>
<td>Cost per passenger km</td>
<td>Measures the efficiency of 'like' trips – although underplays the question of overall efficiency of the type of journeys served. i.e. – tends to adjust-out the issue of whether the 'average trip' is under-priced based on distance.</td>
</tr>
<tr>
<td>Standard service frequencies</td>
<td>Peak and non-peak. Indicates level-of-service, average wait times (when multiplied by 0.5), and the overall attractiveness of off-peak travel.</td>
</tr>
<tr>
<td>Operating hours/span</td>
<td>Indicates overall level-of-service, especially for the many passengers with non-9 to 5 travel patterns.</td>
</tr>
<tr>
<td>Annual maintenance expenditure</td>
<td>Perhaps measured per km system length ... Can benchmark overall rate of maintenance, and whether maintenance rates are sufficient.</td>
</tr>
<tr>
<td>Universal provision of real time info</td>
<td>Average age of vehicle as percentage total life-cycle. An indicator of passenger comfort, system image, and reliability.</td>
</tr>
<tr>
<td>Fleet maturity</td>
<td>An indicator of whether an effective fare regime can be implemented, as well as an indicator of customer ease-of-use.</td>
</tr>
<tr>
<td>Regional smart card</td>
<td>(y/n?) An indicator of whether an effective fare regime can be implemented, as well as an indicator of customer ease-of-use.</td>
</tr>
<tr>
<td>Urban density</td>
<td>By residents, dwellings, number of jobs, and/or commercial floorspace. Measures the transport potentialities of regions and locations.</td>
</tr>
<tr>
<td>Regional population</td>
<td>Present and projected growth. Also assists to measure the latent transport potentialities of regions and locations. Some definitional difficulties expected with respect to defining catchment area.</td>
</tr>
<tr>
<td>Percentage population within 800 m mass transit</td>
<td>Measures effectiveness at delivering direct transit accessibility across the region (or at other scales).</td>
</tr>
<tr>
<td>Suburbanisation</td>
<td>Proportion households in urban/suburban/rural locations. Proportion of new dwellings forecast for construction within established and 'new' areas. Also indicates transport potentialities.</td>
</tr>
<tr>
<td>Location efficiency</td>
<td>Proportion of regional household incomes to housing and transport combined. Also measurable at different scales. Assesses transport 'strain' and overall economic efficiency of transport system outcomes for the community.</td>
</tr>
<tr>
<td>Housing stress</td>
<td>Proportion of regional households where averaged housing costs exceed 30% of household budgets. Good indicator of housing cost/ supply/demand outcomes.</td>
</tr>
</tbody>
</table>
Transit real estate strategy
Proportion total mass transit operator revenues from retail and real estate-related activities. Indicates whether a holistic, contemporary approach is being taken to mass transit as a diversified business.

Bike network quality
Qualitative appraisal of the overall effectiveness of bike infrastructure planning. Here, we rate the quality of the network. Missing links lead to lower scores.

Pedestrian network quality
Qualitative appraisal of the overall effectiveness of pedestrian infrastructure planning and delivery. Rate the quality of the network.

Category 4. Transit accessibility to key amenities

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBD access</td>
<td>Proportion regional households within 30 minute transit journey to CBD. Can be considered a proxy for employment accessibility.</td>
</tr>
<tr>
<td>Higher Education access</td>
<td>Proportion regional households within 30 minute transit journey to major university.</td>
</tr>
<tr>
<td>Public Health access</td>
<td>Proportion regional households within 30 minute transit journey to major hospital.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Category 5. Qualitatively-oriented review categories</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-destination network?</td>
<td>Discusses whether transit network caters effectively to non-radial, non-CBD travel.</td>
</tr>
<tr>
<td>Transit investment linked to localized land use planning changes?</td>
<td>Discusses whether 'true' integration of land use and transit investment is occurring. Is there a framework in place which leverages transit investment with supportive re-zoning?</td>
</tr>
<tr>
<td>Fully-developed TOD policy framework in-place?</td>
<td>While many jurisdictions nominate TOD as a goal, those locations with an ad-hoc approach outnumber those with a comprehensive TOD policy framework in place. Without a comprehensive framework, only limited TOD outcomes can be expected.</td>
</tr>
<tr>
<td>Number of clearly nominated TOD locations</td>
<td>Indicates both the extent of TOD opportunity, and the level of progression into formalised TOD policy frameworks.</td>
</tr>
<tr>
<td>Travel Demand Management (TDM)</td>
<td>Does the location have a TDM framework in place? This indicates the overall sophistication of transport planning in a particular location/city.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Category 6. Analyses particular to the corridor, sub-regional and precinct scales</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transit service-levels</td>
<td>Frequency, service span, etc as localised figure.</td>
</tr>
<tr>
<td>Transit usage</td>
<td>Mode shares and daily trips at local level.</td>
</tr>
<tr>
<td>Pedestrian and cycling infrastructure</td>
<td>Qualitative assessment at local scale. May also include metric assessment of bike infrastructure (e.g. length dedicated, protected lanes).</td>
</tr>
<tr>
<td>Walking and cycling performance</td>
<td>Rates of walking and cycling at local scale. Mode shares, daily trips.</td>
</tr>
<tr>
<td>Station access mode splits</td>
<td>Relative usage (%) of various modes to access local mass transit station (car-based; walking; cycling, and feeder transit).</td>
</tr>
<tr>
<td>Jobs/housing balance</td>
<td>Measures the localised balance between employment and residential land use, hence the potential for sub-regional self-containment and trip minimisation.</td>
</tr>
<tr>
<td>Number of residents/jobs within station catchment</td>
<td>Absolute numbers of jobs and residents within station area (800 m for rail), catchment, or corridor. Indicates overall travel demand and transit ridership potential. Look at number of dwellings and floorspace also.</td>
</tr>
<tr>
<td>Project and precinct-level densities</td>
<td>Similar impacts on transport use as at the regional scale. Represented as a dwelling unit or floorspace-based density figure (usually per HA).</td>
</tr>
<tr>
<td>Car ownership</td>
<td>At-precinct or sub-regional level. Some locations are fundamentally more sustainable transport-intensive by virtue of lower car ownership and use.</td>
</tr>
</tbody>
</table>
Sources of indicators and metrics

The analysis metrics and elements listed in the tables came variously from the sources listed below – keeping in mind that many of these individual units of analysis were raised as important factors in multiple sources, without any one individual source identifying more than a handful of potential analysis units or metrics: ASBEC (2010); Cervero (1998); Cervero and Arrington (2008); Cullinane (2003); Cameron et al. (2004); Dodson and Sipe (2006); Geerlings et al. (2007); Guers and van Wee (2004); Hemily (2004); Hughes et al. (2003); Hull (2008); Knowles (2007); Litman (2009, Litman 2010); Mageean et al. (2000); Mees (2010); Moriarty and Mees (2006); MTC (2009); NSW (2010); TCRP (2004); TCRP (2003); Loader and Stanley (2009); Nelson et al. (2007); Newman and Kenworthy (1999); TfL (2009); ULI (2009); Vuk (2005); Walker (2008).
In order to develop better methods for the analysis of outcomes and performance in transport and public transport more specifically, a range of contemporary considerations and needs come into play. These include the following.

- Recognition of changing contexts, and willingness to engage in new directions and develop new working methods.
- Ability to take a wider, more holistic approach to assessing the benefits of transit investment and improvement, while still retaining focus and relevance.
- A more robust look at the performance metrics of mass transit in particular. This means re-engaging with the engineering-based performance of rail (for example), but also with urban impacts and the social, economic, environmental, and design benefits of transit.
- Engagement with land use and the issue of density, while not being overwhelmed by this aspect as the only issue worth considering.
- Willingness to benchmark and undertake comparative cluster analysis of places or urban regions based on key transport-related metrics. This may include a new willingness to embrace the uncertainties and peculiarities involved in cross-analysis between ‘different’ locations. Despite a common reluctance to do so, it is believed that the benchmarking of even quite different urban contexts can be revealing and beneficial.
- Ability to work at different scales and to relate changes and performance in one scale to outcomes at various other scales. These scales are primarily the regional, metropolitan, urban, corridor, suburb, and localised or precinct scales.
- A more up-to-date effort to identify and monetise the social, environmental and ‘wider economic’ benefits of sustainable transport, and of shifts from car travel into sustainable modes.
- A full balancing of benefits and costs – rather than focusing overly on ‘lowest cost options’.

If we accept that these new urban planning and infrastructure directions are worth pursuing, then new analysis tools based on carefully selected metrics and fields of analysis will assist us to move forward. As we enter a new era of transport priorities, with public transport returning to the forefront of urban quality-of-life and economic considerations, the ability to understand our existing situation and chart a clear direction forward becomes more important than ever.

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References


Litman, T., 2010. The future isn’t what it used to be. Victoria, Canada: VTPI.


