Uneven Roads: Addressing the Inconsistencies in Local Road Valuation Across New Zealand

Insight article – October 2024

Local governments' inconsistent approaches to the valuation of the local road network decrease the usefulness of available valuations for prioritisation and lead to malinvestment.

Local councils value local roads. Valuation approaches are neither necessarily consistent with the methodology applied by NZTA to assess the capital value of the state highway network nor standardised across different councils. As a result, the capital value of local roads may be significantly under- or overestimated across regions.

The lack of consistency in valuation approaches also affects the comparability of results and could distort decisions around investment, maintenance and user charges.

As such, we currently need a clear, appropriate, and consistent method (or methods) to value the capital value of local roads across New Zealand. This constitutes a significant knowledge gap that the current article further investigates.

This article lists local road valuation approaches and evaluates their usefulness.

This article identifies and evaluates possible methodologies for estimating the capital value of New Zealand's local road network. Local councils and central government agencies could use the findings to address the current inconsistencies in valuation approaches and enable better-informed decision-making for local road investment, maintenance, and user charges. The outputs will improve our understanding of the socio-economic and financial costs of providing and using the New Zealand transport system.

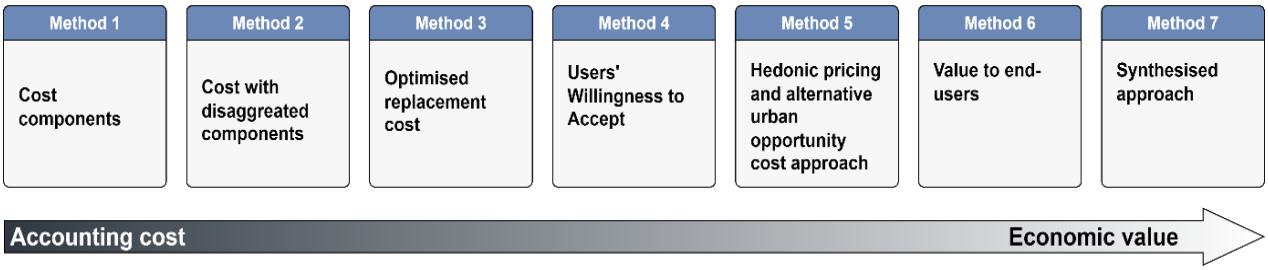
This insight article's investigation of local road valuation approaches aims to:

- Encourage the assessment of the appropriateness and applicability of economic methods for estimating the value of New Zealand's local road network.
- Help inform how an economic approach to local road valuation might operate.
- Explore how local road valuation approaches could assess their appropriateness and applicability in New Zealand.

We identified seven methods for the valuation of roads.

We identified seven available methods for valuing roads, as shown in Figure 1. The suggested variation from accounting to economic valuation methods shows the potential underestimation of roads' (economic) value for techniques that do not capture the value to end-users.

Figure 1 Overview of different valuation methodologies



Source: Principal Economics

Method 1: The Cost method (including book value, replacement cost and written down replacement cost as well as conventionally known ORC and ODRC)

This approach is based on different components of road values identified in the common asset valuation practices. This could be the use of historical prices (i.e., the book value method) or consideration of (the latest available data on) land value plus other components (i.e., replacement cost and the written down replacement cost). Local councils commonly adopt a variation of this approach, which is more widely considered in the literature for transport infrastructure asset valuation. The latest WSP report methodology fits within this method due to its limited optimisation, which is acknowledged in their report with reference to NZ IAS 16 (WSP, 2023, p. 8).

We suggest that the conventional valuation approaches fit within the Cost method.

- **Book value:** current value based on historical cost adjusted for depreciation
- **Replacement cost:** current value based on cost of replacing/rebuilding the asset

- **Written down replacement cost:** current value based on replacement cost depreciated to current condition,
- **Market value:** price the buyer is willing to pay,
- **Equivalent present worth in place:** historic cost adjusted for inflation and wear.

In addition to these methods, the Productivity realised value estimates the net present value of the benefit stream for the remaining service life. We suggest this approach for capturing benefits is more consistent with the economic value approaches (methods 4 to 7)

Method 2: The Improved Cost method

The Cost method could be further improved by disaggregating its different components of it and potentially using a more comprehensive range of cost indices to inform cost escalation. In telecommunication, for example, Principal Economics (2024) developed a range of detailed cost indices for identified disaggregated operating and base capital expenditures. Another example is Srinivasan and Parlikad's (2017) developed method for a wider range of values by considering safety, serviceability, etc. The features of this method are as follows:

- Disaggregate Specialised Infrastructure Assets: Break down current cost categories into more specific components, i.e., differentiate pavement into more specific types like residential, commercial, and industrial uses, reflecting different wear and tear rates and service requirements. Using more accurate cost categories and indices will decrease uncertainty and improve the robustness of short-run estimates of values.

- Separate Operational and Non-operational Assets: Classify assets based on their operational status to more accurately assess their depreciated value and investment needs.

The weakness is the potential inconsistency across regions in the data availability required for more detailed categorisation, leading to gaps in valuation accuracy across regional councils.

Method 3: Optimised replacement cost

We suggest a more extensive optimisation of method 1 for integrating transport and land use leads to method 3. This method is particularly useful for identifying inefficiencies within the network, considering the cost of inefficiencies in future investments, and addressing them gradually over time. This would consider the replacement and depreciated costs and the strategic optimisation of the entire network configuration based on current and future transportation needs. The strength of this approach is its true optimisation of the network over time and

avoidance of inefficiency. The approach is customisable and scalable, but the initial implementation is complex.

Method 4: Users' willingness to accept based on the current values paid for using roads

Another approach that provides a conservative estimate of the value of roads is the cost to the users, including tolls and RUCs. This approach's estimate of the value of roads will be conservative because it does not consider the (full) economic benefits to users (consumer surplus).

Method 5: Alternative urban opportunity cost approach

A more advanced valuation approach is to consider the value of roads based on an 'over the fence' approach after controlling for the value of access. A hedonic price modelling approach will be adopted for this approach, as we describe below. This approach provides a more comprehensive valuation of the road values but still excludes the producer surplus.

Method 6: Value to end-users considers down-stream and up-stream value of roads

The most comprehensive approach to the valuation of roads is based on their contribution to the economic outputs by considering their direct and indirect impacts. Principal Economics (Torshizian et al., in publication) Recently, we developed an approach using a spatial Computational General Equilibrium (SCGE) model and a robust spatial analysis framework for disaggregating the impacts of road redundancy scenarios to the local road level. This methodology could be further refined to provide information about the total value of roads (for both freight and private vehicle uses) and by considering more local roads and their features. An essential feature of Method 6 is the consideration of the transformative value of roads[1], which the marginal economic methods do not capture.

Method 7: Synthesised approach

We suggest developing a synthesised approach using the advantages of each of the identified methods. For example, we could calibrate the stock values estimated from methods 1 and 5 with the distribution of benefits identified from our extensive spatial CGE database.[2]

[1] i.e., roads, and their features, are associated with major changes in the structure of the economy and the long-term environmental, economic, social and other outcomes.

[2] We acknowledge that method 5 provides an estimate of stock value while CGE provides annual estimates.

Why do we need to consider the economic valuation approaches?

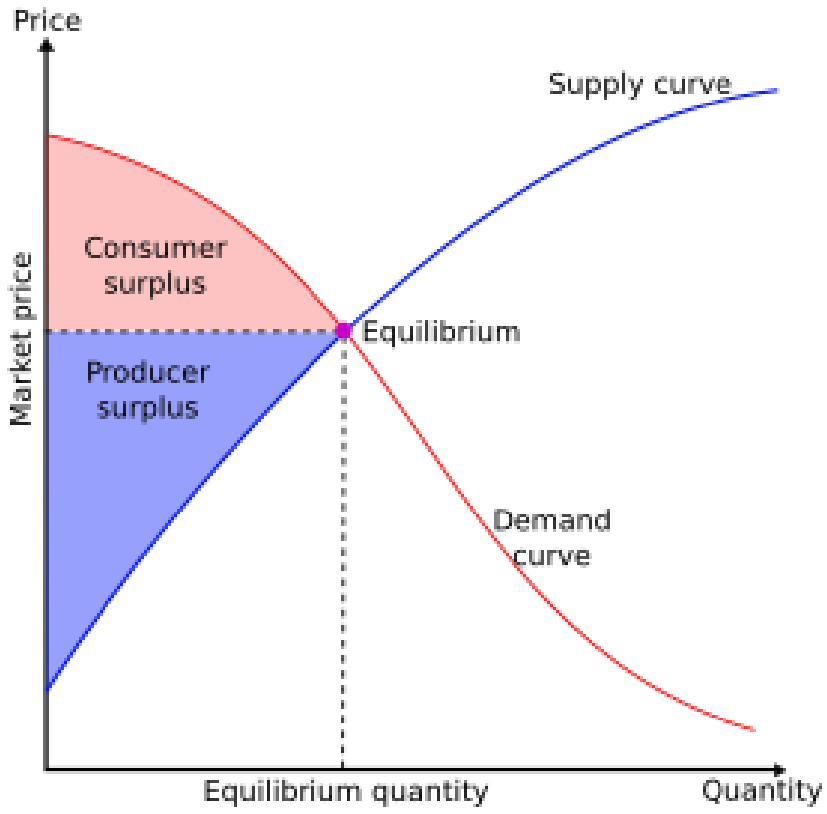
There is a substantial difference between the financial cost of replacing road assets, which is conventionally considered for valuation, and their economic value to end-users. The total benefit of assets includes the sum of consumer and producer surplus, which is equal to total social welfare.[3] The consumer surplus is the monetary gain of consumers because the cost of developing the asset is less than the highest price, they would be willing to pay. Similarly, producer surplus is the monetary benefit to producers.

Suppose the purpose of the valuation is prioritising investment. In that case, an accounting-based approach may lead to prioritising costlier road linkages instead of those with the highest economic value. Hence, we suggest that the economic methods for road valuation should be considered within the scope. This is challenging given that councils do not currently consider the economic surplus for a range of reasons, including its overlap with their other funding and financing tools, as well as legislative barriers for capital capture. These need to be considered in detail, and we suggest engagement with local councils to ensure that the identified approach will be helpful. We suggest further consideration of willingness to pay (WTP) using our established price elasticity database (or other databases), which provides information about the WTP of different socioeconomic groups.

Figure 2 shows the economic surplus (ES), which is the sum of consumer and producer surplus. ES may be larger or smaller than the engineering cost depending on a range of factors that will be discussed in our response. For example, the value of a road with a significant role in the supply chain will likely be underestimated if the ES (particularly the producer surplus) is not fully captured.

[3] Also referred to as economic surplus or Marshallian surplus.

Figure 2 Economic value consists of consumer and producer surplus



Source: Economics textbooks

Pros and cons of currently available evaluation approaches.

Table 1 shows our initial evaluation, based on our current knowledge of these methods, the preferred method could be one of the economic approaches (methods 5 to 7), followed by methods 1 and 2.

Table 1 Evaluation of the usefulness of the methodologies

		Methods						
#	Criteria	1	2	3	4	5	6	7
1	Usefulness for valuation[4]	L	L	M	M	H	H	H
2	Data availability	L	L	M	H	H	H	H
3	Legal barrier	H	H	H	M	M	M	M
4	Overlap with other council tools[5]	H	H	H	M	L	M	M
5	Transparency	H	H	M	H	H	H[6]	H
6	Cost of update	M	M	L	M	H	H	H
7	Cost of shift (Low cost = High)	H	H	L	M	M	L	M
8	Feasibility of consistent valuation	H	H	M	H	M	M	H
9	Readiness level	H	H	L	M	M	M	M
	Summary	H	H	M	M	L	M	M
	Overall rank	**2**	**2**	**3**	**3**	**1**	**1**	**1**

Source: Principal Economics

Note: L = Low rank; M = Medium rank; H = High rank.

The other criteria considered are:

- Regulatory Compliance: Method 1 most closely adheres to international accounting and valuation standards, which is crucial for public sector transparency and accountability.
- Annual Updates: all approaches (except for method 4) benefit from regular revaluation, which aligns with the need for ongoing assessment and adjustment of asset values based on market conditions and asset wear, which could benefit the dynamic needs of local road valuations.
- Physical Inspections Limitation: All approaches lack physical site inspections, which might be necessary to accurately assess local road conditions and specific features like bus lanes and cycle paths. The councils' finance teams are aware of this common issue. We should investigate further solutions to improve this.

[4] The purpose of method is assumed to be decision-making for local road investment, maintenance, and user charges.

[5] Less overlap is ranked as High.

[6] We acknowledge that the General Equilibrium (GE) approach is less transparent but the ranking is about using the outputs of the GE approach.

- Asset Specificity: due to data limitation, there are limited information about unique aspects of local roads, such as smaller scale infrastructure and community-specific needs. This should be further investigated.

Table 2 further considers method 1. The first column suggests that the approaches considered in the second column could be utilised by other methods as well as method 1. The table should be further expanded with inputs from stakeholders and regional council teams.

Table 2 Further consideration of the features of Method 1

Method	Detailed approach	Features	Pros	Cons
1, 2	Book Value	Based on historical construction cost depreciated to current time	Relatively simple to calculate upon availability of data. Uses straight line depreciation function to depreciate asset	Does not take into account the condition of the asset, usage of the asset. Changes in the price are not accounted for. Results can be misleading for older assets with higher condition rating.
1, 2	Replacement Cost	Cost to replace old asset with new one	Calculated from construction price per lane mile. Data readily available. Easily understandable.	Valuation of asset with good condition from this method unsuitable. Construction price depends upon external market forces.
1, 2	Written Down Replacement Cost	Based on historical cost of asset adjusted to pavement condition rating to get current asset value	Asset condition governs the valuation. Easily Understandable.	Harder to calculate if historical cost not present. Different condition measure gives different valuation.

1, 2	Equivalent Present Worth (ORC/ODRC)	Based on historical cost adjusted to account for inflation, depletion, and wear	Accounts for changes in prices and usage.	Valuation is unreliable due to fluctuations in inflation on a day-to-day basis.
1, 2, 3	Productivity Realised Value	Based on the productivity of the remaining service life of the asset	-	Not used as true construction date for all pavement sections is not available, so calculating the remaining service life is not possible. It is affected highly by different definitions of productivity.
1, 2, 3, 5, 7	Market Value	Based on the price the buyer is willing to pay	-	The market price is too volatile to predict.
5, 6, 7	Economic value	Based on the impact on end-users	Accounting for the social value of road	Less transparent to non-technical people Potential overlap with other local council financing tools Political acceptability is unclear

Source: Principal Economics inspired by Acharya (2014, pp. 14–15)

The critical point is that roads are only economically valuable once the integration of land use and transport systems is fully considered. We suggest this criterion be considered further in investigations of road valuation approaches.

Different approaches to disaggregating local road valuations have their focus, but incorporating economic evaluation adds a crucial perspective.

We suggested a range of criteria to identify the best approach. We initially evaluated the identified methods, exploring method 1 in particular, and included more information on methods 5 (hedonic pricing) and 6 (value to end-users). We recommend considering different case studies to test the usefulness of the identified approaches to different circumstances. Overall, we suggest incorporating economic evaluation will undoubtedly add valuable insight to local road valuation.

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