Equitable funding of pavement maintenance for low volume roads

A report for the Road Controlling Authorities Forum Special Interest Group on Low Volume Roads

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Making sense of the numbers

This report provides a method for Councils to make allocation formulae. The formulae are to allocate to rating units the cost of pavement maintenance for low volume roads necessitated by the industrial activity. The equitableness of applying the allocation method is assessed as a "user pays" approach.

The traffic loading from production from each industry in the District can be calculated using engineering methods referenced in the report. Engineering formulae allocate costs to industrial ratepayers of different industries pro rata to their level of traffic loading in the long-term. For each ratepayer within an industry, the allocation is further influenced by the distance of the rating unit from a state highway and by the production intensity of land use.

The allocation formulae derived using the method are transparent because:

- Ratepayer types are defined according to Schedule 2 of the Local Government (Rating) Act 2002.
- Ratepayer charges are calculated according to Schedule 3 of the Local Government (Rating) Act 2002.
- Influences on charges that the Council decides, such as distance and production intensity are clearly specified using "policy weights".
- The report also provides:
    - A method to reduce the rating charge by an amount to account for the benefits that the industry provides to the community.
    - A method to levy charges on non-industrial ratepayers who enjoy these benefits.

A selection of hypothetical worked examples is provided to demonstrate how the allocation formulae work.

Contents

1 Introduction

1.1 Purpose of this report

The Special Interest Group - Low Volume Roads (SIG-LVR) of the Road Controlling Authorities Forum (NZ) Inc (RCA Forum) commissioned BERL to provide a process for Councils to equitably allocate charges to ratepayers for the cost of their pavement maintenance for low volume roads.

The Local Government Act 2002 (LGA) sets out the duties of local Councils when setting charges on ratepayers (refer Appendix A). The overarching principles of financial management set out in the LGA oblige Councils to act prudently, and to "promote the current and future interests of the community". The LGA also prescribes the specific financial instruments (rates and borrowing mainly) that empower Councils to charge ratepayers to meet these costs, together with other associated duties and powers.

The Local Government Act (Rating) 2002 , a companion enactment, provides further detail on how land is to be categorised for setting rates, together with the factors that Councils may use to calculate rates (refer Appendix B).

There is no specific definition of, or reference to, equitableness in either enactment as far as setting rates is concerned. There are, however, duties set out under s101(3) of the LGA. These duties oblige Councils to consider a number of outcomes (Appendix C) associated with the setting of rates. One of these impacts is noted in s101(3)(b), as "the overall impact of any allocation of liability for revenue needs on the community".

To provide a process for local Councils to equitably allocate charges to ratepayers for the cost of pavement maintenance for low volume roads, we have undertaken the following steps:

- Outlined a process, based on engineering reports commissioned by the RCA Forum, to estimate the allocation of pavement consumption cost per hectare associated with different land use.
- Outlined, using the framework of the LGA, the duties of Councils when funding pavement maintenance on low volume roads.
- Provided information on the feasible rating methods available to Councils to fund pavement maintenance costs, using the framework of LGA (Rating).
- Assessed how these methods can be used to allocate pavement maintenance costs across different types of ratepayers.
- Assessed the equitableness of these allocations, in the context of the outcomes for ratepayers, in terms of four standards of equity: uniform charge – no equity; user pays – benefit principle; beneficiary pays – benefit principle; those more able to pay, pay more – ability to pay principle.
- Illustrated how to apply our recommended findings with worked examples.

We emphasise that there is no indication within the LGA or LGA (Rating) of a standard of equitableness to guide selection of methods. That selection is for Councils to decide based on their own preferences, which are generally focused on promoting the current and future interests of the community. Councils are empowered to levy rates from those sources that they determine to be appropriate, having regard to certain considerations.

1.2 Scope of this report

In developing their 30 year infrastructure plans, Councils are bound to ensure that low volume road pavements are fit for purpose.

In the main, Councils may levy rates and borrow to fund the maintenance cost of low volume roads that are not met from other sources. There are other methods for raising funds, such as through contributions for new developments, financial contributions for environmental impacts, and public-private partnerships. These are not discussed.

In deriving allocation formulae, the SIG-LVR has specifically asked us to develop a process which considers the local share component of maintenance costs that are not covered by NZTA financial assistance rates (FARs).

Consequently, this report is concerned only with equitable allocation of the local share of maintenance costs.

2 Pavement consumption cost allocations

2.1 Introduction

This chapter outlines relevant key findings from two contributing reports:

- "The impact of land use on pavement wear" by John de Pont of Transport Engineering Research New Zealand Limited (TERNZ), included as Appendix D
- "The impact of heavy vehicle traffic on road pavements" by Graham Salt of Geosolve, included as Appendix E.

Together, these attached reports provide a process that uses data and known engineering formulae to allocate an average annual pavement consumption cost per hectare, for each type of land use, in the District.

Since pavement consumption is estimated per hectare for each land use, in principle, we can estimate a corresponding average cost by rating unit. Rating unit costs can then be aggregated at an industry level to provide estimates of average pavement maintenance costs for the District by industry.

We summarise this process in this chapter and highlight the key results from the two reports.

2.2 TERNZ report

2.2.1 Basic methodology for traffic generation from land use

The TERNZ report outlines how for each land use activity, average annual transport requirements, in tonnes per hectare, over a long period (e.g. 35 years), for both outbound and inbound movements, can be determined. These freight requirements can then be converted into a standard measure of freight loading, called Equivalent Standard Axles (ESA) per hectare, which can be used to calculate annual pavement consumption costs from different industries. An average annual measure enables comparison of both short-term and long-term pavement consumption on a common basis.

The report (p4) provides the following steps to estimate the heavy commercial vehicle (HCV) traffic generation from particular types of land use. It says:

1 Identify the land use or activity to be considered i.e. forestry, quarrying, dairying, dry-stock beef farming, stock finishing, sheep, etc.

2 Determine the comparison period to be used to compare the HCV traffic generated by differing land uses. Recommend calculating the HCV traffic generated on the basis of a complete production cycle and then determine the equivalent annual average traffic.

3 Determine the average output values in tonnes or tonnes per hectare for that land use utilising:

   a. Regional or local stocking rates

   b. Local milk production statistics

   c. Local beef, sheep, wool production statistics

   d. Local forest harvest statistics or quarry statistics

4 Determine the average input values for the land use in tonnes or tonnes per hectare utilising:

   a. Regional or local fertiliser or lime application rates

   b. Regional or local statistics for forest restocking rates

c. Regional or local statistics for feed supplement use

d. Regional or local statistics for fuel, fencing, etc.

5 Determine the HCV traffic generated by the established land uses.

a. For each transport task, identify the typical vehicle configuration(s) that will be used and their payload capacity

b. Determine the ESA per payload tonne associated with each input and output quantity

c. Determine the ESA per hectare for the land use or activity being considered

2.2.2 Identify land use for assessment

The TERNZ report (p4) distinguishes three types of land use relevant to HCV traffic:

- Land-based activities such as farming and forestry, where the scale of the inputs and outputs is based on the area of land involved. These production rates and input rates may vary substantially around the country but within a District for a class of farm with a specific production intensity they are likely to be consistent and thus it is reasonable to use average values.
- Activities such as quarrying, where the output volumes are much less directly dependent on the land area and may be proportionately much higher than for farming or forestry activities. Typically, the number of quarries within a District is relatively small and thus it is appropriate and not too difficult to assess the traffic generated by them on an individual basis. A quarry will have a resource consent which specifies the permitted level of production and in some cases the maximum allowable number of truck movements per day.
- This approach of considering individual quarries can also be applied to other significant generators or attractors of heavy vehicle traffic such as dairy factories, meat processing facilities, wood processing facilities and export ports. As with quarries, the input and output volumes of these land uses is not directly linked to their land area but will usually be able to be obtained relatively easily.

The TERNZ report (p5) proposes using a one year cycle. This is achieved for each land use activity by assessment of long-term maintenance needs and then deriving the average annual input and output levels and determining the traffic generated by these. This enables comparison of the impacts of different land use activities on a common basis.

A key result from this discussion is that pavement consumption will depend on production intensity and this will vary considerable with class of farm and for non-area land uses such as quarrying and food processing.

Another key result from this discussion is that pavement consumption from land uses with different production cycles (e.g. forestry compared with pastoral and dairy) can be compared on a common basis.

2.2.3 Production volume and production intensity

The TERNZ report (p5) explains how land uses can be grouped into those that are area-based and those that are not.

For area-based production, production volume is determined using the annual average output rates in tonnes or kg per hectare for the particular District or region under consideration. Importantly, the report explains how the intensity of pastoral and dairy land uses varies considerably over the three main classes of pastoral

production systems and five main classes of dairy production systems. Similarly, forestry yields per hectare vary significantly on a regional basis.

The key result from this discussion is that pavement consumption costs will vary with production intensity in a specific way that is not covered by relative land area. We note that alternative measures to represent relative magnitude of pavement consumption, such as capital value of the rating unit, may be a better measure in some cases. However, as shown below, because engineering traffic loading formulae and data are based on land area, it is convenient to use land area as a basis and then adjust for production intensity and distance.

For non-area-based production, the TERNZ report discusses substantial generators and/or attractors of heavy vehicle traffic where the volume of traffic is not directly related to the land area being used for the activity. Obvious examples include quarries, dairy factories, saw mills and pulp mills, meat processors, fertiliser plants and ports. The TERNZ report describes how for single large scale activities, the associated major input and output traffic volumes are often published. Quarries are usually subject to a resource consent which will usually specify how much material can be extracted per annum. In some cases the resource consent will also specify the maximum allowable levels of truck traffic. Similarly large processing facilities will often publish their production volumes in annual reports and other publicity material.

The key result from this discussion is that production intensity for these non-area-based land uses can be estimated using published data. One way to do this is to adjust a land area based allocation formula for production intensity. Since these types of land uses are generally few in number, a better way may be to estimate the HCV traffic volume separately for each business location. Statistics New Zealand define each of such business units as a geographic entity. This means traffic loading per hectare need not be calculated.

2.2.4 Heavy vehicle traffic impacts for different transport tasks

The TERNZ report (p11) describes a method to account for traffic loading from different trucks involved in various input and output activities, using a consistent measure We must account for:

- number of truck trips for input and output to land use
- different truck configurations applying different levels of loading to the pavement.

The report notes that the heavy vehicle traffic stream, consists of a whole range of vehicles with different axle configurations and axle loadings. An estimate of traffic loading is calculated by converting all the loading from all the axle groups of heavy vehicles into a number of passes of an Equivalent Standard Axle (ESA). The ESA normalises the pavement wear effect of the spectrum of axle loads and configurations expected on a pavement to the equivalent number of passes of a dual-tyred single axle loaded to 8.2 tonnes (80kN).

The key result from this discussion is that a method is available for expressing the different traffic loading for diverse commodity production in common units of ESA per tonne of production.

A further key result is that this method can be used to convert land use production in terms of tonnes per hectare (or tonnes per entity) for the different production intensities (farm classes, quarrying, food processing, etc) into a traffic loading in terms of ESA per hectare (or ESA per tonne).

2.2.5 Distance

The TERNZ report (p17) notes that the foregoing method to derive traffic loading in terms of ESA per hectare for various levels of production intensity does not account for distance of road travelled. That is, the amount of

pavement wear that will result is determined by the loading effect multiplied by the length of road over which it is applied.

The key result from this discussion is that distance travelled is an important factor to include when calculating pavement consumption.

2.3 Geosolve report

The Geosolve report entitled "The Impact of Heavy Vehicle Traffic on Road Pavements" [1] describes a process (p7) to estimate the increased cost of pavement consumption due to additional loading. This method can be linked to the methodology outlined in the TERNZ report.

The key result from this discussion is that pavement consumption by industry, in terms of ESA per hectare, can be expressed as a cost in dollars per hectare to be allocated to rating units of that industry.

2.4 Conclusions

In conclusion, the two reports provide Councils with a formula-based process to allocate pavement consumption cost per hectare of production using:

- The methodology to estimate the number and types of vehicles required per hectare for each land use, based on the commodity produced and the average annual production volumes per hectare.
- The methodology to convert the vehicle loading per hectare into average annual ESA per hectare.
- A method to calculate the cost impact of this average annual vehicle loading per hectare.

A land area basis for allocation does not account sufficiently for distance and production intensity and so it is important to account for these influences separately. That is the topic of chapter 5.

[1] "The Impact of Heavy Vehicle Traffic on Road Pavements" accessed at: http://rcaforum.org.nz/sites/public_files/images/THE%20IMPACT%20OF%20HEAVY%20VEHICLE%20TRAFFIC%20ON%20ROAD%20PAVEMENTS.pdf

3 What Councils must consider in funding pavement maintenance

3.1 Introduction

Councils are obliged to consider outcomes under the LGA.

In this chapter we identify the main outcomes to ratepayers arising from pavement maintenance. We can think of outcomes as benefits and burdens, both currently and in the future.

In meeting their obligations under s101(3)(a) of the LGA 2002, Councils need to consider all of the following when funding pavement maintenance:

- The community outcomes to which the activity primarily contributes.
- The distribution of benefits between the community as a whole, any identifiable part of the community, and individuals.
- The period in or over which these benefits are expected to occur.
- The extent to which the actions or inaction of particular individuals or a group contribute to the need to undertake the activity.
- The costs and benefits, including consequences for transparency and accountability, of funding the activity as a separate item from other activities.

These are explained further in Appendix C.

In deciding whether to fund pavement maintenance at all, the Council needs to consider s101(3)(b) of the LGA:

- the overall impact of any allocation of liability for revenue needs on the community. This amounts to considering the variety of ways it can use funding instruments to allocate pavement maintenance costs across the community.

3.2 Duties of Councils under the Local Government Act (2002)

Pavement maintenance must be planned within a Council's infrastructure strategy. It must meet current and expected future levels of service. Councils must develop the most likely scenario of the future management of pavements. Once future infrastructure needs are signalled, the Council must complement the infrastructure strategy with a financial strategy. The financial strategy is a budget that is partly based on expected population and land use changes.

The Council implements its financial and infrastructure strategies using funds sourced from ratepayers, current and future, in a long-term plan that is required to:

- be prudent (we interpret this as meaning "acting with care for the future")
- promote the current and future interests of the community.

Financial management duties are contained in the LGA. They are briefly outlined in Appendix A.

4 Rates types available under the Local Government Act (Rating) 2002

There are a number of funding instruments under Schedules 2 and 3 of the LGA (Rating) to levy charges on rate payers to provide Councils with revenue to meet its financial strategy. These are described in detail in Appendix B.

Those most useful in the context of pavement maintenance costs for low volume roads in rural locations, are set out below.

4.1 Rates

4.1.1 General rate

Uniform rate for all based on land value; capital value; or annual value.

Differential rate where rating units are according to different types of:

- Land use
- Activities permitted or proposed
- Land area
- Land location
- Annual value
- Capital value
- Land value.

The differential rate is calculated taking into account any of these factors, land value, capital value, annual value.

4.1.2 Uniform general charge

Essentially a fixed amount per rating unit.

4.1.3 Targeted rate

Uniform rate on rating unit

or

Differential rate on rating units where rating units are categorised by:

- Land use
- Activities permitted or proposed
- Land area
- Land location
- Annual value
- Capital value
- Land value.

The differential rate is calculated taking into account any of these factors

- Annual value
- Capital value
- Land value
- Value of improvements
- Area of land within the rating unit.
- Area of land within the rating unit that is sealed, paved, or built on.

4.2 Postponement of rates

Postponement of rates may be desirable for industries where cash flows do not match annual cycles. This is the case for forestry where harvest cycles are very long. For quarrying and mining, cash flows are likely to fluctuate over long commodity cycles of many years. In such cases, firms may find it difficult to meet annual rates charges.

Postponement policies may defer payment for a specific period, or defer until a particular circumstance or event occurs (e.g. significant level of harvesting, cessation of quarrying or mining).

5 Allocation methods

5.1 Introduction

In this chapter we provide methods for Councils to allocate pavement maintenance costs to ratepayers. The allocation methods are based on a selection of rating instruments specified in the LGA (Rating), outlined in chapter 4. These methods account for:

- total pavement maintenance cost (PMTC) split out by pavement maintenance cost for each industry (PMCI)
- the benefits to the beneficiaries identified in chapter 3.

Local authorities are required by LGA (Rating) to calculate rating charges using two steps:

(1) define different categories of rateable land using one or more of the categories in Schedule 2 LGA (Rating) (refer Appendix B)

(2) calculate each category's share of the PMTC using factors in Schedule 3 LGA(Rating) 2002 (refer Appendix B).

Estimating the magnitude of the benefits that accrue from pavement consumption over the 30 year infrastructure strategy is something Councils will have to deal with on a case by case basis. Pragmatism is important. For some Councils a broad estimate may suffice. In some cases, Councils may prefer to have a detailed estimate for a particular industry.

For different Councils, different pavement consumers produce different benefits to the community. For example, forestry harvesting and fruit harvesting may utilise temporary workers who reside outside the District. They may also benefit other Districts rather than themselves. Consequently, the benefits from the harvesting side of forestry for social, environmental and cultural outcomes may be limited. By contrast the production side of forestry, involving planting, thinning and pruning, can have substantial community benefits. In this case, silvicultural teams including their managers and owners are often located in small District centres. Other industries such as dairying and sheep and beef cattle farming, which may employ many people over the long-term, can provide substantial community benefits also. At the same time, shearing and wool collection is now done by professional teams that can work internationally. Similarly beef and lamb processing and milk processing often occurs in plants located outside of the District.

Assuming Councils can estimate benefits from each industry over the 30 year term of the infrastructure strategy, we can estimate an annualised "Net PMCI" as:

Net PMCI = PMCI – net benefits from the industry to the community

Our method allocates the net PMCI over rating units of that industry. The formula to calculate the rating charge for each rating unit accounts for:

- the rating unit's share of total land area (or the total production volume in the case of quarrying, food processing, etc) for the industry in the District
- variation in distance travelled on low volume roads
- variation in production intensity per hectare (such as from different farm systems)

There is an important piece of preliminary work for the Councils to guide their definition and selection of allocation formulae. This is based on the duties of Councils described in chapter 3.

We assume that each Council can estimate (using methods described in chapter 2) average annual pavement consumption per industry (PMCI) in dollar terms, for each land use in the District. Note that we are only interested in estimating materially significant pavement consumption. Typical industries include: dairy farming; forestry; sheep and beef cattle farming; and horticulture. The tourism industry also impacts on pavement maintenance, but accounting for its impact is beyond the scope of this work. We assume that it is impractical for a Council to include factors for actual distance and production intensity in the calculation of pavement consumption by industry. Our method includes factors to account for variations between rating units in terms of distance and production intensity.

5.2 Targeted rate – category of rating unit

The findings of the Geosolve and the TERNZ review outlined in chapter 2 show that the attributes of low volume road pavement consumers are best described by:

- land use, indicating ESA per vehicle
- production intensity, indicating number of, and types of vehicles for inputs and outputs
- distance travelled on low volume roads.

As required by the LGA (2002), we use Schedule 2 categories (Appendix B) to define types of low volume pavement consumers for the purpose of levying differential charges:

- land use category as a proxy for land use attribute
- land area as a proxy for production volume relevant to land area
- land value or capital value as a proxy for production intensity
- land-location category as a proxy for distance.

In summary, using Schedule 2 categories of land use, land value or capital value, and land location, we can create groups of land users according to their characteristic pavement consumption by industry, production scale and distance travelled.

In our model we have arbitrarily defined the distance levels as “near” and “far”. In practice these levels can be defined by a specific distance limit or some other measure. Further, many more distance levels may be included if desired. Similarly, we have arbitrarily defined four categories (very high, high, low, very low) for the production intensity. Overall these are eight (2x4) categories of rating unit.

5.3 Targeted rate – calculation of charge

Once we differentiate types of pavement consumers, we wish to allocate a charge to them that reflects their pavement consumption. We first note that pavement consumption varies markedly by industry and different engineering formulae are developed on an industry basis. Hence land use is a useful way to calculate rates.

We select a targeted rate because it provides an option to use land area to calculate the charge, whereas a general rate does not.

Schedule 3 of the LGA (Appendix B) provides the list of factors we can use to calculate each rating unit’s share of the total pavement maintenance cost for the relevant industry.

We assume that the Council has estimated the PMCI for each industry from the technical methods described in chapter 2. We further assume that it has reduced this by the benefits of the industry to the community to beneficiaries described in the next section. The result is that the Council has an estimate of the ‘net PMCI’ of

the industry. This is the net cost of pavement maintenance required for each industry, for the pavement maintenance set out in the 30 year infrastructure plan.

The formula to calculate the rating charge for each rating unit is given in equation 1:

Equation 1 Rating charge for rating unit = Net PMCI x Sh x Wt.

Sh is the rating unit's share of total production area (or production volume for quarrying, food processing etc.) for the industry in the District.

Wt is a "policy weighting" applied by the Council to account for:

- variation in distance
- variation in production intensity (such as from different farm systems).

Wt can be used to include other matters relevant to pavement consumption and its benefits that the Council deems appropriate.

In our model, to account for distance for each rating unit, we arbitrarily select two levels of distance ("near" and "far") and four levels of production intensity (very high, high, low, very low). Councils can themselves define actual metrics for these levels and may also define more or less levels. In our model, for each industry we have 8 pavement consumption types (2 distance types for each of 4 production intensity types), 8 policy weights. Consequently, 8 policy weights applied to equation 1 result in 8 allocation formulae.

The formulae apportion PMCI in different ways. We assess the equitableness of these apportionments in chapter 6.

When all the (Wt) weights are 1, the models assign a charge to each rating unit in the category that reflects its share by land area (if land area is used) of the pavement consumption cost calculated by the methods in Chapter 2. When the weights are different from 1, they reflect the Council's discretion to distribute the burden of cost in a different way across different combinations of distance and production intensity. The Council can easily scale the policy weights with a constant scaling factor to ensure that total of the costs remains equal to the net PMCI for each industry.

The Council may elect to vary the policy weights further because it feels it is more "equitable" to place more of the burden on some (e.g. higher value) rating units than others.

5.4 Targeted rate - charging for benefits

Where a ratepayer is a beneficiary of industrial activity and is not itself associated with low volume pavement consumption, we can assume that it enjoys monetary and non-monetary benefits which it can be charged for, and which reduce the PMCI to a net PMCI as discussed above.

The Council may recover all such amounts from ratepayers who benefit. To do this the Council may levy differential charges on non-land-production beneficiaries to cover the aggregate of these amounts for all industries.

There are many ways to do this. We select a targeted rate because of the flexibility it provides for calculating charges. To keep the process transparent, we suggest simple approach such as:

(1) do nothing, since the cost of setting targeted rates outweighs the benefits of doing so

or

(2) levy a targeted rate:

- assess the benefits that each pavement consumer industry provides the community over the 30 years of the infrastructure plan (if assessment is not possible and to be pragmatic, the Council may decide to make a reasonable estimate)
- reduce each PMCI by this amount to produce the net PMCI (above)
- aggregate the value of benefits from all industry pavement consumers
- allocate this aggregate as charges to rating units
- as a percentage measure of allocation to beneficiaries (such as residential ratepayers), use proportionate capital value of the rating unit of the total capital value of all non-pavement consumer rating units

Alternative percentage measures of allocation are possible. For example, use proportionate number of connections to a reticulation system of the total number of connections of all beneficiary rating units.

As with the land use rating units, we are required to use the categories in Schedule 2 to group rating units for charges. The "land–use" category is useful because it will differentiate residential and various commercial types of beneficiary ratepayers from pavement consumers such as dairy farms. Land use can also differentiate between residential rating units and various commercial types. We do not model these differences here.

We are required to use the factors in Schedule 3 to calculate charges for the rating units. Capital value is a proxy for asset wealth of rating units. We can assume that such asset wealth includes some contribution from the industrial activity of some or all pavement consumer industries in the District. Capital value of a rating unit is therefore a reasonable indicator for economic development produced by industrial activity.

6 Equitableness of impact

6.1 Introduction

In this chapter, we assess the equitableness of the allocation methods in chapter 5.

To be equitable a Council must "promote the current and future interests of the community". There are many standards of equitableness, depending on the social norms or preferences of the District.

The Council achieves equitableness by imposing different charges on different ratepayers. Using the model in chapter 5, a Council can model different charges on different ratepayers by adjusting the policy weights (Wt) in the rates calculation formulae.

Next we discuss the standards for equitableness and the implications for equitableness from different charges.

6.2 Standards of equitableness

To promote the current and future interests of the community, the Council can select different rate types to differentially levy its ratepayers. These, together with a standard of equitableness in parentheses are:

- uniform charge (all pay the same amount)
- user pays (identifiable user pays cost at market value)
- beneficiary pays (beneficiary pays for market and non-market value)
- ability to pay (charge should be proportional to the beneficiaries ability to pay).

There is nothing in the LGA 2002 that requires the Council to explain how it decides that an allocation method achieves "promoting the current and future interests of the community". We have separated the "beneficiary pays" principle from "user pays". The two are usually combined into one "benefit" principle. We separate them to emphasise the importance of recognising the substantial benefits that accrue to non-land use ratepayers from land-based production that is reliant on rural low volume roads.

6.3 Assessment of equity

6.3.1 Uniform charge

A Council may simply decide to levy a uniform charge on all rating units based on land value or capital value. Annual value, though optional, is not useful in this context. Essentially, a uniform charge does not explicitly account for who bears the benefits and costs, both market and non-market, of pavement consumption.

This is a simple measure to calculate. It does not target equity in any way. However, because it is based on a value that increases with increase in asset wealth, the distribution of cost it achieves has an "ability to pay" equitableness. That is, those more able to pay, do so.

Land value, however, may be an inappropriate factor since low land value pavement consumers, such as forestry firms have a high ability to pay and will be high pavement consumers, yet when using land value as a rating basis, they will have a proportionately lesser charge than some lesser pavement consumers.

6.3.2 Targeted rate - charging industry for pavement consumption

If a Council decides to sets the policy weights (Wt) all equal to 1, the net effect generally accords with the user pays principle to an approximation. However, we have better knowledge from the engineering reports that

using different Wt to account for "distance" and "production intensity" may provide a closer fit to the "user pays" principle.

If a Council sets the policy weights (Wt) to be greater than 1 for higher land value or capital value categories, then the net effect is stylised more on the ability to pay principle.

6.3.3 Targeted rate - charging for benefits

If a Council decides to follow our methodology for charging for benefits, it is generally following the beneficiary pays principle. Higher benefits and rating charges for them are associated with higher values of the rating unit.

6.3.4 Using weighting to avoid unintended outcomes for future ratepayers

Councils may elect to use the policy weights (Wt) to lower rates for rating units with special characteristics. This may be done to "promote the current and future interests of the community".

If higher rates are set for more distant rating units (to charge for increased pavement consumption) with the same land value, this can have the perverse outcome of encouraging industrial processing plants to locate near the town centre. More generally, it would tend to discourage regional development.

Councils may instead wish to use the policy weights (Wt) to create lower rates at a certain threshold of distance from the town centre. This could be used to encourage industry to locate beyond these distances and/or boundaries.

In a sense this method follows the ability to pay principle. The Council is intervening and relieving some industries of their rates burden at the expense of other current and future ratepayers. Under this approach, the Council decides that these other ratepayers have the ability to pay for the beneficial economic development and socio-environmental outcomes that are achieved.

7 Recommendations

Guidance: We recommend Councils use the method presented in this report as guidance to allocate long-term pavement maintenance costs for low volume roads. The method is not a prescription and there is no one "best" allocation formula for all.

Simplicity: It is important for Councils to be pragmatic and transparent. Hence we recommend that Councils emphasise simplicity when applying the method, as demonstrated in the worked examples provided.

Rules: The method recognises and follows the legislative rules (set out in the Appendices) for Councils. We recommend that Councils apply these rules in a sensible way that is transparent to all ratepayers.

Materiality: Some of these rules require the Councils to consider outcomes such as benefits for all ratepayers from maintaining low volume road pavements. This task should be done with regard to the materiality of the outcome for pavement maintenance costs of low volume roads.

Consistency: It seems sensible for Councils to adopt a consistent approach to setting allocation formulae and so we recommend that Councils be flexible and seek a shared approach for this.

8 Hypothetical worked example – Weka District Council

The following is a hypothetical case to illustrate the application of the equitable allocation methods presented in this report.

Weka District Council is introducing a differential targeted rate to fund the local share of pavement maintenance costs for Council roads. The maintenance will be needed annually over the next 10 years and is generally necessary because of the impacts of heavy vehicles of forestry, dairy, and pastoral land use.

The aggregated targeted rates will cover the expected pavement maintenance cost. The District relies on these industries to underpin its community. We assume that Weka understands the benefits of each industry for the non-industrial ratepayers over the next 10 years and can estimate these in a pragmatic way. Weka has a policy that: (i) non-industrial land users should be charged for the benefits they receive and (ii) industrial land users should meet net costs, being pavement maintenance costs less the benefits they provide.

The annual pavement maintenance cost for each industry has been calculated with projections of likely industrial activity. The maintenance has also been costed in current dollars.

Weka will allocate the net cost for each industry, using differential targeted rates for rating units with that particular industrial land use. Weka will aggregate the cost of the benefits of all industries. It will allocate this total benefit cost to non-industrial ratepayers, using a differential targeted rate.

Weka estimates annual pavement maintenance costs of $4m. Calculations attribute this to forestry ($2m); dairy ($1m); and sheep and beef ($1m). Weka has decided that non-industrial ratepayers benefit from industries in many ways and that a suitable deduction in allocatable cost for each industry is forestry (nil); dairy ($0.9m); and sheep and beef ($0.5m). Weka has made this estimate of benefits in a pragmatic way in consultation with policy and finance teams in its administration.

The total benefit cost is therefore $1.4m annually to be allocated to non-industrial ratepayers. The net PMCI allocatable to industrial land uses are: forestry ($2m); dairy ($0.1m); and sheep and beef ($0.5m).

Weka Policies

Weka has the following policy for pastoral and dairy rating units.

“Apply the following policy weights to account for higher pavement consumption and more distant and more production-intensive rating units.”

Distance	Distance factor	Production intensity	Production intensity factor	Policy Weight
Near	1.0	V High	1.2	1.2
		High	1.1	1.1
		Low	0.9	0.9
		V Low	0.8	0.8
Far	1.2	V High	1.2	1.44
		High	1.1	1.32
		Low	0.9	1.08
		V Low	0.8	0.96

Weka has the following policy for forestry rating units.

"Apply the following policy weights to accounts for higher pavement consumption and more distant and higher production intensity rating units."

Distance	Distance factor	Production intensity	Production intensity factor	Policy Weight
Near	1.0	V High	1.5	1.5
		High	1.2	1.2
		Low	1.0	1.0
		V Low	1.0	1.0
Far	1.5	V High	2.25	2.25
		High	1.8	1.8
		Low	1.5	1.5
		V Low	1.5	1.5

Weka has a policy of charging residential and other non-industrial land uses for the benefits they receive from industry. The annual charge is pro-rata the capital value share of their land.

Rating charge - pastoral land use

Woolly Farm is a pastoral rating unit that is classified with a 'far' distance and a 'high' production scale. Hence its policy weighting factor is 1.32. It has a rating unit land area of 140ha. Weka's total pastoral land area is 197,566ha. Hence its productions share (Sh) is 140/197,566.

The industry net pavement cost for pastoral industry is $0.5m. Wooly Farm's annual targeted rate for low volume pavement consumption is approximately:

Net PMCI x Sh x Wt

= $0.5m x 140/197,566 x 1.32

= $467.69

This calculation is repeated (in excel spreadsheet) for all pastoral rating units. The sum of the charges (Z) will be different to the total nets PMCI, because of the impact of policy weighting.

To get the actual rating charge, all the approximate charges have to be scaled by the same factor:

Net PMCI/Z = $0.5m/Z

Rating charge - forestry land use

Pine Hill is a forestry rating unit that is classified with a 'near' distance and a 'low' production intensity. Hence its policy weighting factor is 1.0. It has a rating unit land area of 605ha. Weka's total forestry land area is 75,044ha. Hence its production share (Sh) is 605/75,044.

The industry net pavement cost for forestry industry is $2.0m. Pine Hill's annual targeted rate for low volume pavement consumption is approximately:

Net PMCI x Sh x Wt

= $2.0m x 605/75,044 x 1.0

= $16,123

As for pastoral, to get the actual rating charge, scale the approximate charge by:

Net PMCI/Z = $4.0m/Z

Where Z is the sum of the approximate individual charges.

Rating charge - dairy land use

Muse Farm is a dairy rating unit that is classified with a 'near' distance and a 'high' production intensity. Hence its policy weighting factor is 1.1. It has a rating unit land area of 169ha. Weka's total dairy land area is 2,025ha. Hence its production share (Sh) is 169/2025.

The industry net pavement cost for dairy industry is $0.1m. Muse Farm's annual targeted rate for low volume pavement consumption is approximately:

Net PMCI x Sh x Wt

= $0.1m x 169/2025 x 1.1

= $9,180.

As for pastoral, to get the actual rates charge, scale the approximate charge by net PMCI/Z = $0.1m/Z.

Where Z is the sum of the approximate individual charges.

Rating charge - non-industrial land use

Ms. Myth owns a residential rating unit with a capital value of $174,854.

The total capital value of all non-industrial, forestry, non-dairy and non-pastoral land is $901,722,700.

Ms. Myth's annual rating charge for the benefits of land use industry is:

$1.4m x $174,854/$901,722,700

= $271.69

9 Hypothetical examples showing variations of policy weights

The hypothetical worked example above shows how a targeted rate for pavement consumption is calculated with Net PMCI, Sh and Wt. While the impact of Net PMCI and Sh on the targeted rate is clear, the impact of the policy weight, Wt, is not immediately obvious. This chapter presents three examples where production intensity and distance scale are changed and the resulting policy weights (Wt) are shown in tables and plotted in figures for illustration of the impact of production scale and distance scale on the policy weights (Wt).

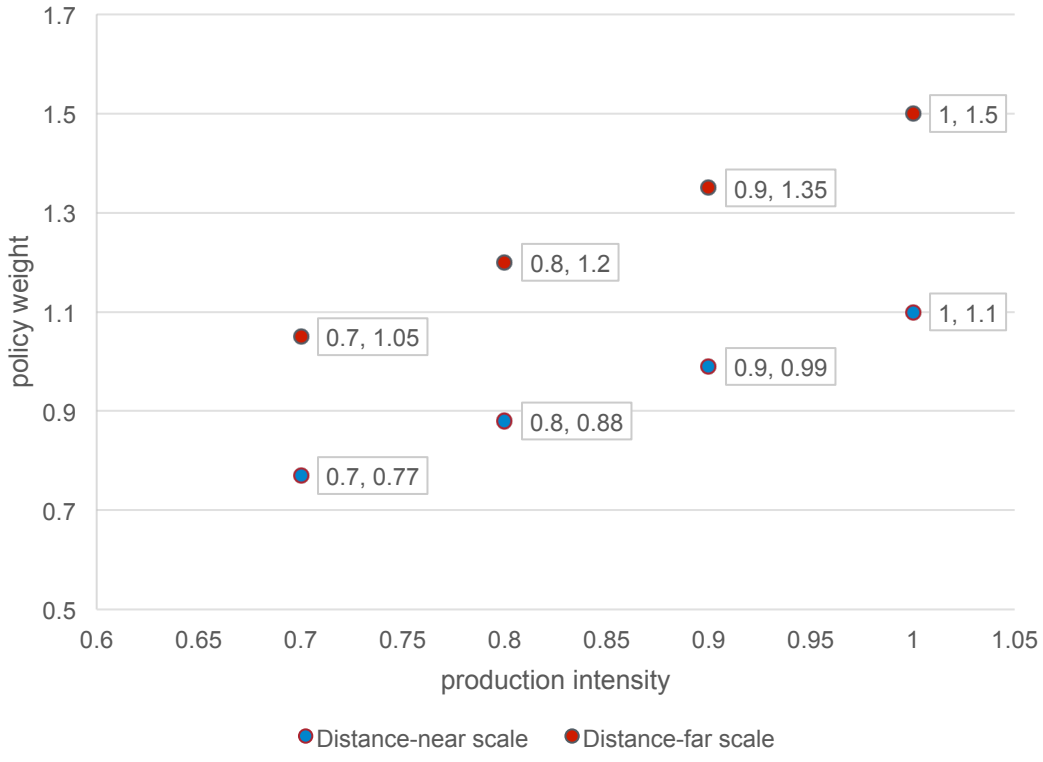
These examples demonstrate the kinds of results that Councils can achieve by changing Wt by changes in both distance and production intensity to give effect to policy decisions.

Example 1

Table 1 Example 1 Policy weights for production intensity and distance

Production Intensity	Wt (Distance = near)	Wt (Distance = far)
1.00	1.10	1.50
0.90	0.99	1.35
0.80	0.88	1.20
0.70	0.77	1.05

Figure 1 Example 1 Policy weights for production intensity and distance



In example 1 two levels of distance and 4 levels of production intensity produce eight policy weights (Wt). The difference between the Wt for each distance level increases as the production intensity increases and this illustrates the combined effect of production intensity and distance.

Example 2 differs from Example 1 because the distance = far level is greater than before, while the production intensity levels are unchanged. The divergence of the Wt for each distance level is greater than before.

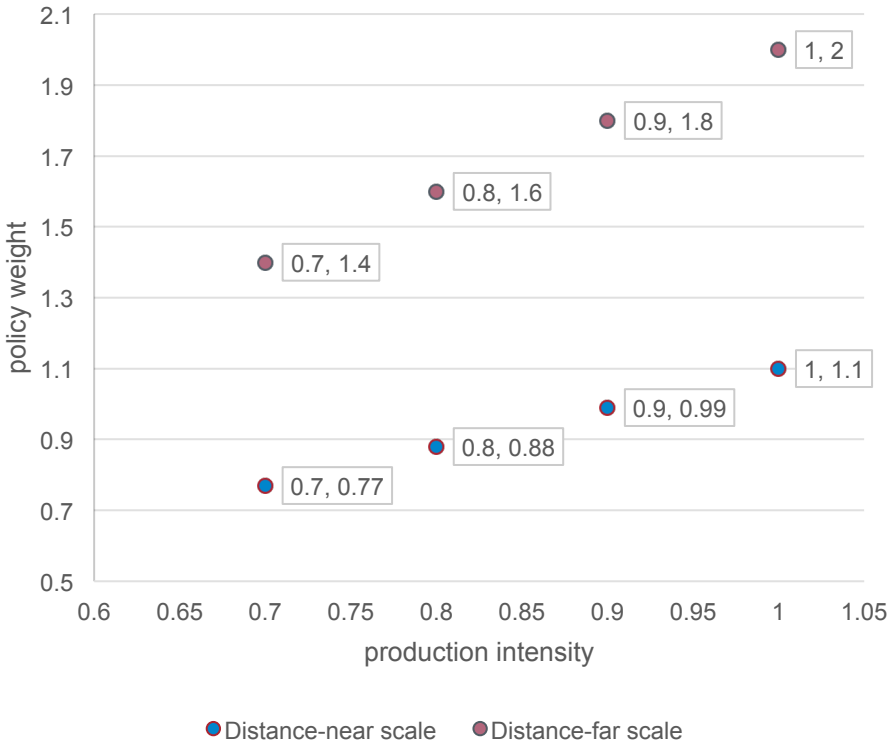
Example 3 differs from Example 1 because the two highest and two lowest production intensity levels are more spread out than before. The divergence of the Wt for the two groups of production intensity levels is illustrated In Figure 3.

Example 2

Table 2 Example 2 Policy weights for production intensity and distance

Production Intensity	Wt (Distance = near)	Wt (Distance = far)
1.00	1.10	2.00
0.90	0.99	0.99
0.80	0.88	0.88
0.70	0.77	0.77

Figure 2 Example 2 Policy weights for production intensity and distance

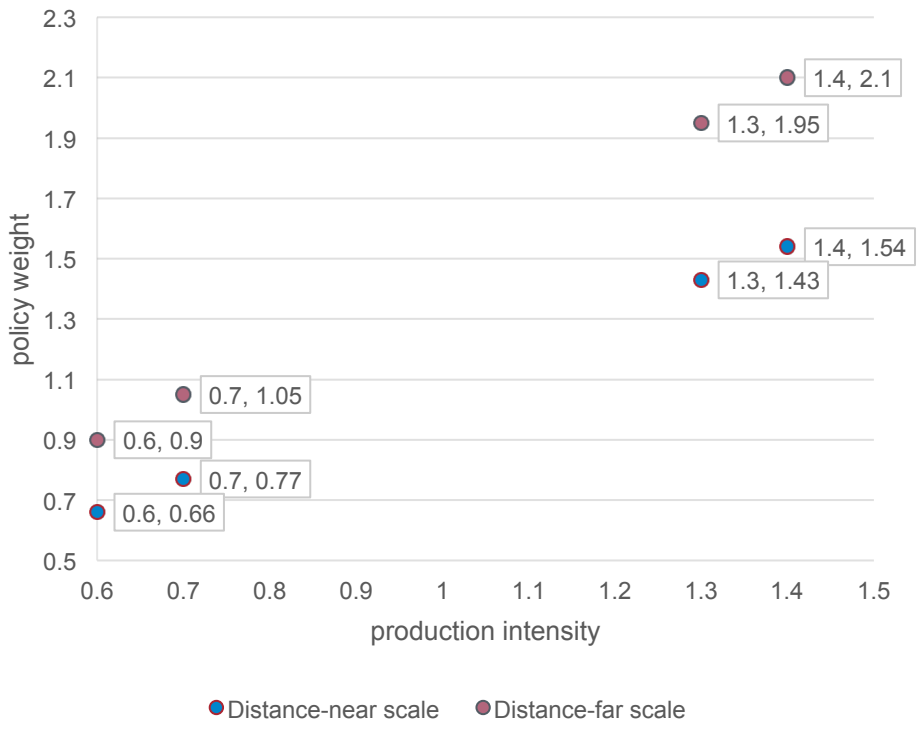


Example 3

Table 3 Example 3 Policy weights for production intensity and distance

Production Intensity	Wt (Distance = near)	Wt (Distance = far)
1.40	1.54	2.10
1.30	1.43	1.95
0.70	0.77	1.05
0.60	0.66	0.90

Figure 3 Example 3 Policy weights for production intensity and distance



Appendix A Financial and infrastructure obligations

Financial management obligations

In planning for future pavement maintenance needs and costs, Councils must meet financial management obligations under the LGA 2002. These are set out in LGA s101(1) to s101(3). In summary, a Council must exercise prudent financial management to promote the current and future interests of the community. It may draw funding from rates, borrowing and other sources taking into account the main outcomes to be funded, who causes the funding to be incurred, who benefits and when they benefit.

Future desired outcomes for social, environmental and cultural states will also influence funding needs and the appropriate sources of funds for them. Councils will need to be informed of scenarios including for employment status, age, ethnicity, home ownership, and location.

Financial strategy obligations

Councils must prepare a financial strategy under s101A of the LGA 2002. This strategy is phased annually, and it provides a budgeted guide for considering future expenditure, and for showing the impact on rates and charges to ratepayers. Importantly for pavement maintenance, the financial strategy must describe factors set out in s101A(3)(a), including expected changes in land use and in population numbers, together with their implications for infrastructure expenditure.

Infrastructure strategy obligations

Councils must prepare an infrastructure strategy (at least 30 years) under s101B of the LGA 2002 that describes significant infrastructure issues and the principal options to address them.

Under s101B(3), the infrastructure strategy must outline how the Council intends to manage its infrastructure assets, taking into account such matters as future demand and level of service required.

Under s101B(4) the infrastructure strategy must outline the most likely scenario for the management of the Council's infrastructure assets over the period of the strategy and, in that context, must show indicative estimates of the projected capital and operating expenditure.

Appendix B Schedules 2 & 3 Local Government (Rating) Act 2002

Schedule 2 LGA (Rating) 2002

Matters that may be used to define categories of rateable land

1. The use to which the land is put.
2. The activities that are permitted, controlled, or discretionary for the area in which the land is situated, and the rules to which the land is subject under an operative District plan or regional plan under the Resource Management Act 1991.
3. The activities that are proposed to be permitted, controlled, or discretionary activities, and the proposed rules for the area in which the land is situated under a proposed District plan or proposed regional plan under the Resource Management Act 1991, but only if—
    a. no submissions in opposition have been made under clause 6 of Schedule 1 of that Act on those proposed activities or rules, and the time for making submissions has expired; or
4. all submissions in opposition, and any appeals, have been determined, withdrawn, or dismissed.
5. The area of land within each rating unit.
6. The provision or availability to the land of a service provided by, or on behalf of, the local authority.
7. Where the land is situated.
8. The annual value of the land.
9. The capital value of the land.
10. The land value of the land.

Schedule 3 LGA (Rating) 2002

Factors that may be used in calculating liability for targeted rates

1. The annual value of the rating unit.
2. The capital value of the rating unit.
3. The land value of the rating unit.
4. The value of improvements to the rating unit.
5. The area of land within the rating unit.
6. The area of land within the rating unit that is sealed, paved, or built on.
7. The number of separately used or inhabited parts of the rating unit.
8. The extent of provision of any service to the rating unit by the local authority, including any limits or conditions that apply to the provision of the service.
9. The number or nature of connections from the land within each rating unit to any local authority reticulation system.

10. The area of land within the rating unit that is protected by any amenity or facility that is provided by the local authority.
11. The area of floor space of buildings within the rating unit.
12. The number of water closets and urinals within the rating unit.

Notes:

1. For the purposes of clauses 1 to 5, 8, and 10, rating unit includes part of a rating unit.
2. For the purposes of clause 4, value of improvements is the value calculated in accordance with the following formula:

   c – l

   where—

   c is the capital value of the rating unit

   l is the land value of the rating unit.
3. For the purposes of clause 8, the extent of provision of a service to the land must be measured objectively and be able to be verified.
4. For the purposes of clause 12, a rating unit used primarily as a residence for 1 household must not be treated as having more than 1 water closet or urinal.

Appendix C What Councils need to consider

s101(3)(a) LGA 2002

Councils are obliged to consider outcomes under the LGA 2002.

In meeting their obligations under s101(3)(a) of the LGA 2002, Councils need to consider all of the following when funding pavement maintenance:

- The community outcomes to which the activity primarily contributes.
- The distribution of benefits between the community as a whole, any identifiable part of the community, and individuals.
- The period in or over which these benefits are expected to occur.
- The extent to which the actions or inaction of particular individuals or a group contribute to the need to undertake the activity.

The costs and benefits, including consequences for transparency and accountability, of funding the activity as a separate item from other activities.

Market and non-market outcomes

It is helpful to use a framework of total economic value to assess benefits and burdens of pavement maintenance to ratepayers in a District. Total economic value encompasses all the value attributable to market and non-market transactions.

In market transactions:

- profits accrue to land-based producers as well as to other firms, such as primary processors, retail and wholesale suppliers, and service providers
- households benefit from earnings of workers employed in all industries
- firms also benefit from the purchases of households from them.

The economic value of market transactions can be estimated using economic models and official statistics. It is argued that pavement maintenance has allowed land-based production to occur and economic value to accrue. This type of economic value is particularly important in rural Districts where urban service centres rely on the business generated by land-based primary production.

In non-market transactions, economic value accrues because pavement maintenance enables recreation, capital value, the appreciation of residences and businesses, the conservation of the natural estate, and enables future generations to benefit from future employment opportunities and the quality of the environment. In a sense, these benefits are public goods for the District, since they are provided similarly to all and without exclusion.

In non-market transactions burdens are also produced where economic value diminishes because pavement maintenance causes such detriments as environmental degradation, even if temporarily. This would not have occurred without the pavement maintenance.

Some market and non-market transactions can have benefits that accrue outside of the District, although pavement maintenance costs are incurred by the District. Such benefits arise, for example, in the case of

tourism, where pavement maintenance is required to maintain tourist roads, while tourists do not stay or shop in the District, but do so elsewhere in the country.

Tourism within a District also provides recreation, amenity and other non-market benefits to ratepayers.

Materiality

A Council needs to consider whether it is sensible to fund pavement maintenance as a distinct charge to ratepayers.

For some Councils, pavement maintenance costs for low volume roads are not sufficiently large or sufficiently different from other costs to warrant separate accounting treatment. For others, it is important enough to budget and fund separately.

The main point is that a Council has a discretion to select separate accounting treatment for both current and future pavement maintenance.

Causation

A Council needs to consider the identity of the ratepayers, over the 30 year infrastructure plan, who engage in, or refrain from, activities so that pavement maintenance can provide levels of service for ratepayer activities.

The most commonly cited ratepayers are land use producers who frequently use heavy commercial vehicles for forestry, dairying, sheep and beef cattle farming; and horticulture production. In addition, primary processors produce pavement consumption through the transportation of milk, fruit and other produce.

Timing of pavement maintenance

A Council needs to consider the timing of pavement maintenance. For dairying; sheep and beef cattle farming; and horticulture, pavement consumption is generally accepted to be seasonal, but continuous over the long-term. Forestry, by comparison, has the greatest impact on pavement consumption in the years around harvesting time. Forestry companies have some discretion when to harvest and will seek to achieve optimal global log prices at harvest time.

Who benefits

Land use ratepayers

Land use producers who cause the need for pavement maintenance, directly benefit from it. These benefits are market-based and can be quantifiable using economic models and economic projections.

Primary processing industries, such as milk processers and fruit processors, cause pavement consumption through the use of tankers and other transportation to take primary produce to plants.

Non-heavy vehicle owners of low productivity land, such as for lifestyle blocks, derive benefits, through increases in property values, due to high productivity production in their vicinity.

Non-land–use ratepayers

Primary production and tourism continue to underpin the New Zealand economy. Urban centres of rural Districts are reliant on primary production industries which cause pavement maintenance. Rural town are centres for rural finance, primary processing, fuel supplies, and the provision of other goods and services

Network operators such as air, rail, postal, and sea transportation rely in part on land-based production in their Districts, and are associated with low volume roads. Network and utility operators may use low volume roads as corridors for infrastructure, including for electricity supply, postal, and cellphone.

The market-value benefits, such as employment and economic activity that flow indirectly from primary production are measureable using economic assessment tools.

The non-market benefits are largely derived from the economic growth that occurs in the District as a result of primary production. These are difficult to quantify, but can be assessed using social assessment models and qualitative analysis of future scenarios. The non-market benefits that accrue to non-land users include:

- The appreciation of land values
- Improved lifestyle quality from improved amenities
- Health, social services and recreation
- Providing opportunities for future generations
- Increased capacity, from higher District income
- Conservation of the natural estate and protecting biodiversity
- Future generations will benefit from infrastructure and community development supported by current land use production.

It is also important to underpin new growth industries such as tourism that can provide jobs and new opportunities for economic activity. The benefits of tourism cannot be captured in Districts that lack the infrastructure and networks to develop it.

There are market and non-market burdens to beneficiaries as well. These include: a decline in the demand for goods and services needed because of unmaintained roads (e.g. 4 WD vehicles and servicing) and adverse environmental impacts (e.g. increased contamination of land). In the remainder of this report, for simplicity, we have focused on the benefits.

Main community outcome

The discussion above contributes to our understanding of the community outcomes that Councils are required to focus on.

For some Councils, community outcomes largely depend on the economic activity that is derived from the reliable movement of primary goods and freight, such as in rural Districts. In comparison, the community outcomes of Councils that include large population-centres are focused on the movement of people and goods for light commercial activity.

Low volume rural roads therefore underpin the main community outcomes of rural Districts. This conclusion underpins the significant beneficial outcome of pavement maintenance for non-land users in rural Districts.

Appendix D TERNZ report

Appendix E Geosolve report