

Funding and Prioritising Significant Infrastructure - the Impact of the Social Discount Rate Upon Decision Making

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Executive Summary

The purpose of this report is to explain New Zealand's social discount rate policy. In particular, it explains how the relative preference of society to invest for the long term is considered in an economic appraisal (through an associated benefit cost ratio).

When evaluating infrastructure projects, a benefit and cost stream is commonly derived according to how the project improves on a business as usual scenario. These 'raw' costs and benefits (occurring in different time periods) are not directly comparable and thus future values are discounted using some 'social discount rate'. There is no one correct discount rate, with a number in practice worldwide and supported in the academic literature.

The choice of discount rate can substantially affect appraisal results for infrastructure projects, to the point of changing investment prioritisation. The use of high social discount rates tends to favour projects that have benefits in the short-run. At 8% real¹, New Zealand has one of the highest social discount rates in the developed world. Using this discount rate, benefits and costs after about 15 to 20 years have relatively little bearing on investment decisions. This reduces the relative priority of long-lasting, transformational projects that are, all else equal, costly initially with benefits accruing far into the future. Current evaluation requirements stipulate that all benefits occurring outside of a 30 year appraisal period are disregarded.

New Zealand's current social discount rate policy is confused, because it uses one instrument to solve several problems. Evidence from other infrastructure sectors has shown that different discount rates may be appropriate. For example, the energy sector in New Zealand successfully negotiated a 5% discount rate.

New Zealand's social discount rate policy makes it difficult to present the full value of long-lived infrastructure projects. This is particularly important for Auckland Council, as a number of projects in the draft Auckland Plan are long-term in nature.

A report on an alternative to New Zealand's current social discount rate policy, using the shadow price of capital, is included as Attachment A.

¹ Meaning net of inflation

Recommendations

That the Economic Forum:

- a) Note that the current New Zealand social discount rate policy does not take account of the social rate of time preference and therefore is likely to favour short-term infrastructure development.
- b) Note that current policy means that major long-term public infrastructure projects, including many of those proposed in the draft Auckland Plan and EDS, are difficult to fully evaluate because they are long-lived projects (with benefit streams accruing well into the future).
- c) Recommend to Council that, at the appropriate time, it support the need for government policy to accommodate the social rate of time preference within the New Zealand social discount rate policy.
- d) Note that the shadow price of capital approach incorporates and addresses the abovementioned issues.
- e) Recommends to Council that, at the appropriate time, it support the need for government policy to allow for infrastructure projects to be evaluated over the full life of the project, rather than the 30 years stipulated in a conventional analysis.
- f) Support further work on the shadow price of capital approach and the appraisal periods, in collaboration with other relevant agencies, including The Treasury.
- g) Note that a follow-up report will be brought to the Forum at the appropriate time on the results of this further work.

Background

Definitions:

Social discount rate: The conversion of costs and benefits in different periods of time into present value terms that can be directly compared.

Social opportunity cost: The expected rate of return should the funds be used for an alternative private investment.

Social rate of time preference: society's preference for consuming/investing now versus consuming/investing in a future time period.

Displacement and augmentation of investment: the effect of a public sector initiative on the private sector's level of investment over time. A project which leads to further investment is said to be "augmenting".

Decision Making

Social Discount Rate Policy

Auckland hosts a quarter of the world's Fortune 500 companies and two-thirds of New Zealand's top 200 companies. New Zealand's largest and most productive city attracts multitudes of highly skilled migrants every year and accounts for the vast majority of New Zealand's foreign investment. It is clear that the economic success of Auckland is critical for New Zealand. The building blocks of robust and sustainable economic growth are good market-supporting infrastructure. These sorts of projects often require substantial funding and may require central government funding.

For large infrastructure projects to be approved for national funding, the government must be sure that it represents the best value for money for all of New Zealand. A critical component of this is performing a comprehensive benefit cost assessment for each project. Where a project returns a benefit cost ratio greater than 1, it has positive net returns to society. In New Zealand, this methodology is frequently applied to transport projects, and will be applied to all of Auckland’s proposed major transport infrastructure projects (for this reason, the remainder of this paper approaches this issue from a transport perspective). The New Zealand Transport Agency’s (NZTA) Economic Evaluation Manual determines the methodology used to assess such transport projects. One of the most controversial components of this guiding methodology (as well as any other) is the application of a social discount rate.

Understanding the social discount rate

There are two fundamental approaches to determining the social discount rate: the social rate of time preference, and the social opportunity cost, as shown in the figure below. The social rate of time preference is society’s preference for consuming/investing now versus consuming/investing in future time periods.

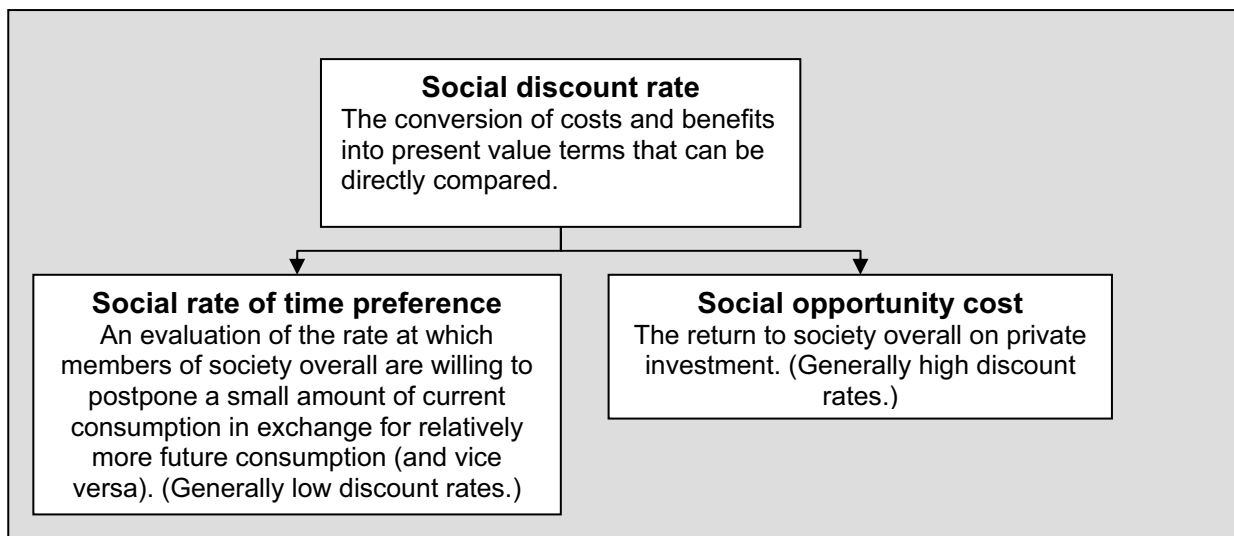


Figure 1: The two approaches to determining the social discount rate

A country’s social discount rate policy should attempt to solve two distinct problems (with ideally two distinct instruments). The first is to take account of an infrastructure project’s ‘wider economic investment’ effects. This means ensuring that public projects do not crowd out/replace even more profitable private sector projects, as measured by their social opportunity cost – as well as taking account of how productivity improvements stimulate more private sector investment. These wider investment benefits and opportunity costs can differ significantly between projects, depending on how the original investment was financed and the kind of benefits they provide. Taking account of these features is critical to ensure value for money.

The second problem is determining the social rate of time preference. It is well accepted by economists that individuals and society in general, place a higher value on benefits and costs that occur in the near future vis-a-vis those that occur many years into the future. Consider for example, asking a two-year-old if they would like a lollipop today, or two lollipops in a years’ time. The social discount rate makes a judgement on the value of benefits and costs received in the future. This “time value” judgement is critical for the aspirations of sustainable investment in New Zealand’s transport network and our corresponding level of wealth over time. The social discount rate currently used in the assessment of transport projects is 8% (real, meaning net of general price inflation; all discount rates here are expressed in real terms).

How the Social Discount Rate Works

This 8% real social discount rate means that policy-makers equate a unit of benefit² received in 30 years time, with 6 cents received today. A reduction in the social discount rate would alter this equation significantly. For instance, at a discount rate of 4%, policy-makers would equate a unit of benefit received in 30 years' time with 31 cents received today (so benefits in the future are given a higher value). This has important implications for the type of projects approved for funding. A lower discount rate changes the prioritisation of transport projects from those that have benefits in the short term to projects that have benefits further into the future.

For example, Figure 2 illustrates this for two hypothetical projects that are mutually exclusive (that is, doing one means you would not do the other). Project A (e.g. widening a road) realises benefits immediately and sustains them indefinitely, while project B (e.g. implementing a rapid transit corridor) has smaller benefits in the short to medium term but substantial benefits in the longer-term.

The decision for which project to invested in lies, in large part, in the value society places on future benefits – a judgment made implicitly by the social discount rate. Using New Zealand's current discount rate of 8%, project A is preferred over project B, because the benefits from project B are realised in the distant future, which is heavily discounted. In fact, transport project evaluation is currently capped at 30 years because any benefits realised after this period are often discounted to zero. This means that the majority of the benefits of project B are excluded in the benefit cost analysis. In contrast, using a discount rate less than approximately 5% means project B would be preferred over project A.

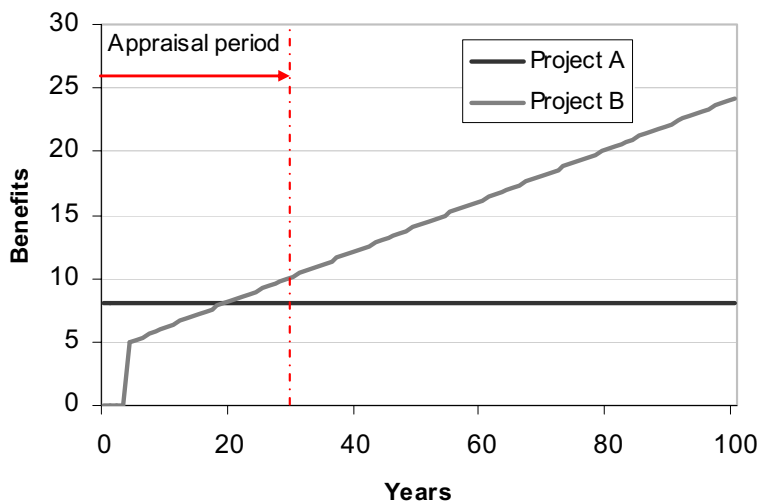


Figure 2: The cashflow profile of long-term and short-term projects

New Zealand's Current Policy

The New Zealand Treasury governs New Zealand's 8% social discount rate, based wholly on the social opportunity cost. It is a single instrument used to solve the two distinct policy problems described above: taking account of the wider economic investment effects; and taking account of costs and benefits in different periods of time. The 8% discount rate is much higher than reasonable estimates of the social rate of time preference, which may be in the range of 3–4%.

² The actual unit of benefit could be time savings in the case of transport initiatives or monetary units in the case of various other projects.

Using a discount rate much larger than the social rate of time preference causes a short term approach in our infrastructure appraisals, because benefits and costs in the medium to long term are largely ignored.

Treasury uses a higher rate because it sets a useful discipline for public projects to be at least as “profitable” as private projects. However, this approach fails to consider several important issues and may be inappropriate (as is demonstrated in Attachment A). To use a pure social opportunity cost discount rate is to take the view that the investment entirely displaces private investment and there is no augmentation of private investment.

Practical Implications

To invest in infrastructure projects that create sustainable economic growth for future generations, Treasury and NZTA’s assessment methodology will need to be changed. The use of a social discount rate which is likely higher than the social rate of time preference rarely makes projects that transform the economy worthwhile, because the benefits of such projects can occur over extremely long periods. This is particularly important for considering solutions to Auckland’s heavily congested transport network.

The following two examples show how changing the social discount rate policy and increasing the appraisal period would change the perceived benefits of long term and short term projects differently. In other words, it would create a change in project prioritisation. In this example, the City Rail Link is shown to be an example of a long-lived project while travel behaviour change projects³ are an example of a short-term project. By incorporating the social rate of time preference into project evaluation over a longer appraisal period, short term projects perform much the same, while long term projects look considerably more attractive.

Long term projects – The City Rail Link

Figures 3-6 below illustrate this point using the City Rail Link (CRL). Figure 3 shows the undiscounted benefit stream of the CRL. Notably, the project’s benefit stream is very similar to the long-lived project in Figure 2 above (project B), where benefits are shown to increase into the future. Figure 4 shows the benefit stream of the economic appraisal using a standard New Zealand appraisal following the Treasury guidelines of an 8% discount rate and a time period of 30 years. This gives a discount benefit stream of 1.8 billion and a Benefit Cost Ratio (BCR) in the order of 1.1. However, if the appraisal period was lengthened to reflect the long-lived nature of the CRL⁴, then the benefits attributable to the project would increase to 2.7 billion and the BCR would increase to a figure in the order of 1.5. This is shown in Figure 5 using a 60 year appraisal period. This example shows how current methodology is biased against long-lived projects, because many of the future benefits are simply not included in the standard evaluation.

³ The figures used in this example are an average of the costs and benefits of eight projects. Projects include community-based initiatives (eg travel awareness campaigns, rideshare etc), household-based initiatives (eg personalised marketing, ‘living neighbourhoods’), school travel (school travel plans), workplace based (workplace travel plans), and substitutes for travel initiatives (eg teleworking).

⁴ Here we use a 60 year appraisal period, consistent with the United Kingdom approach, and broadly consistent with the former Auckland Regional Council’s treatment of the useful life of civic structures.

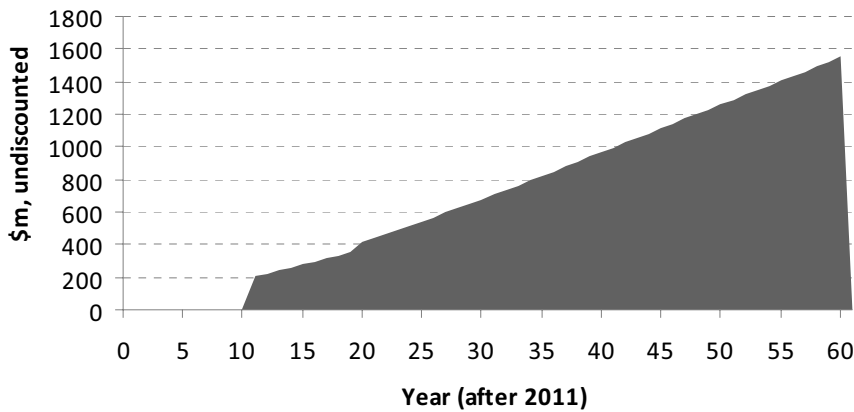


Figure 3: Undiscounted Benefits of the City Rail Link

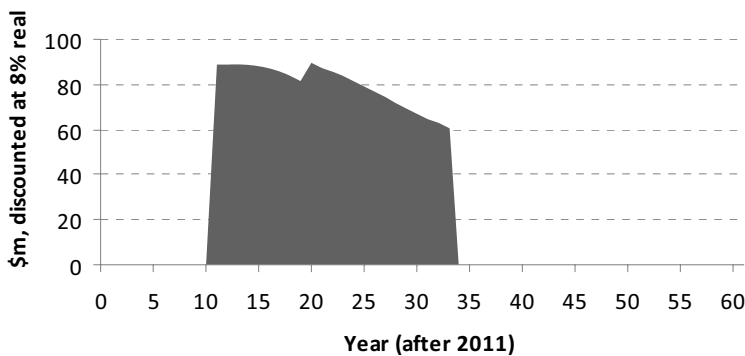


Figure 4: Standard NZ appraisal

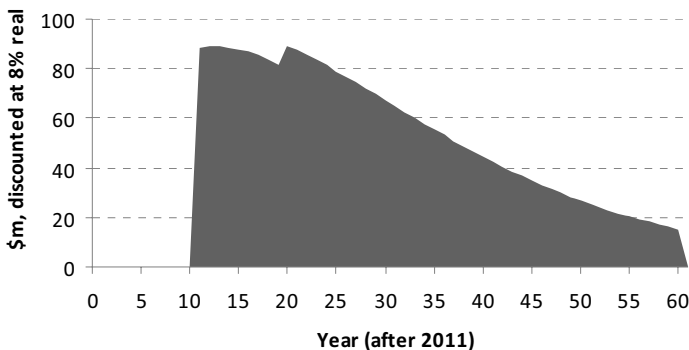


Figure 5: Standard NZ appraisal with an increased appraisal period

Figure 6 then uses the CRL benefit stream (from Figure 3) and shows the difference in perceived benefits using the New Zealand standard appraisal and the United Kingdom (UK) appraisal methodology. The only difference between the two is the discount rate and the appraisal period. The CRL shows a present value benefit stream of 1.8 billion under the New Zealand methodology and a BCR in the order of 1.1. Under the United Kingdom methodology, the same project would be shown to have a present value benefit stream of approximately 11 billion and a BCR in the order of 5.2. Using the same benefit information, the UK methodology would place the benefits of the CRL in the order of 6 times as great as under the standard New Zealand methodology.

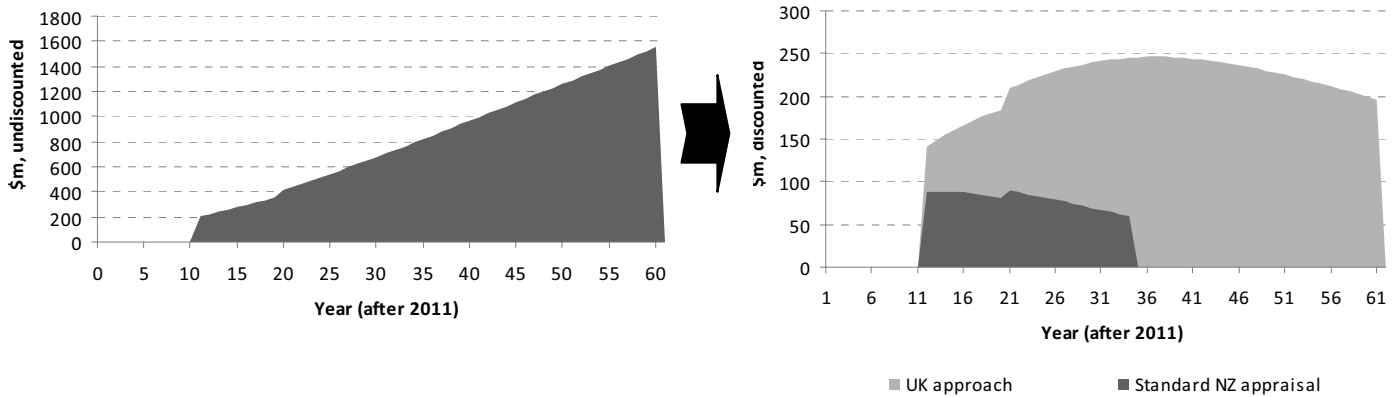


Figure 6: NZ standard appraisal vs UK standard appraisal (derived from the same benefit stream)

Short term projects – Travel change behaviour projects

Travel change behaviour projects are an example of a short-term transport project. Figure 7 shows that the benefits are typically realised in the first 10 years. There are no benefits outside of this period. The figure on the right shows how these benefits are treated after they are discounted using the New Zealand standard approach and the UK approach. Under the New Zealand approach, the project is shown to have a present value benefit of \$800,000 and a BCR of 2.3. Using the UK methodology (3.5% discount rate and an appraisal period of 60 years), the present value is 1.3 times higher (at approximately 1 million), while the BCR is 2.9.

The UK BCR in this example is only 1.2 times the New Zealand BCR.

Figure 7a: Average undiscounted benefits of 8 travel change behaviour projects

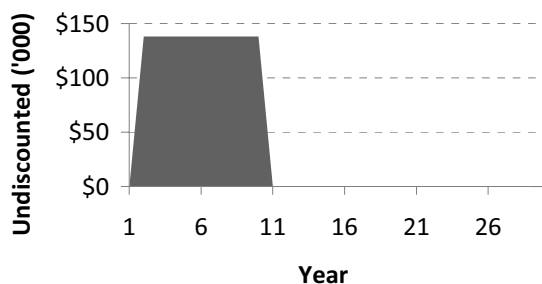
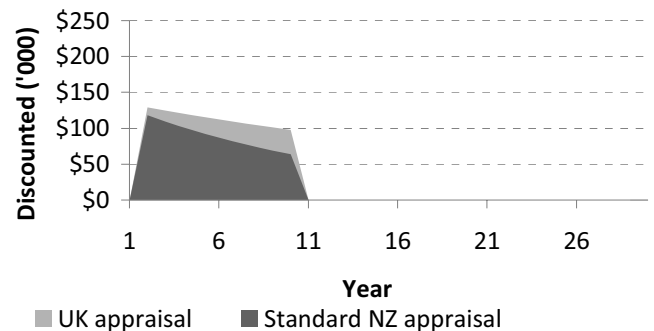


Figure 7b: NZ standard appraisal vs UK standard appraisal (derived from the same benefit stream)



These two examples illustrate several important issues for the relative effect of such a change in discount rate policy on short-term and long-term projects:

- Both projects show an increase in the BCR. However, using the UK social discount rate methodology, long-lived projects are considerably more attractive, while short-term projects are relatively unaffected.
- Incorporating the social rate of time preference (and a corresponding lower discount rate) gives more weight to benefits received in the future. This means long-lived projects are relatively more attractive.
- The *prioritisation* of projects can clearly change in favour of long-lived projects, which deliver benefits into the future. There is a diminished *relative* performance of short-lived projects.
- Using a longer appraisal period provides a more thorough analysis of a projects benefits across time. This advantages long-lived projects, as under current evaluation methodology,

benefits after 30 years are ignored. By nature, short-lived projects would largely be unchanged from a change in the appraisal period.

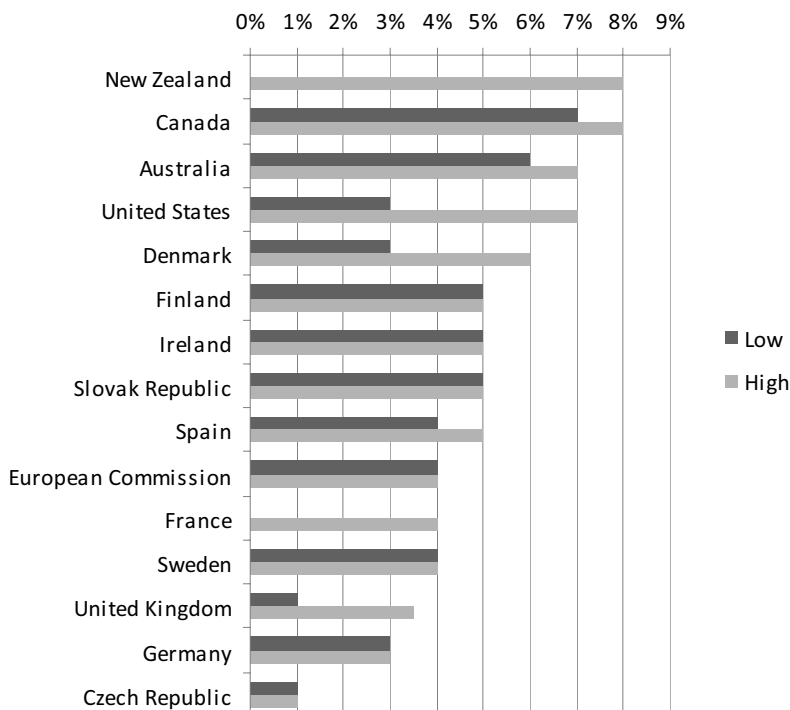
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International comparisons

Figure 6 provided a comparison of social discount rates with other developed countries. Most other developed countries that New Zealand competes against use social discount rates in the 3%-5% range. These countries are therefore able to demonstrate stronger economic justification for undertaking major infrastructure projects, which have higher returns in future periods. While almost all the countries shown here would choose the long-lived project in Figure 2 (project B) with its higher future benefits, New Zealand would choose project A.

Moving towards a more productive economy requires investment. The Global Economic Forum recently released a report showing a strong correlation between a country's infrastructure provision and its global competitiveness⁵, a point recognized, for example, by the government through its considerable investment in broadband infrastructure. For New Zealand to improve its economic prospects, it must become more globally competitive, which means providing quality infrastructure to give cities and firms a competitive edge in the global economy. The government has signalled its commitment to a strong, coordinated approach to infrastructure provision with the release of the National Infrastructure Plan.

This Plan takes a long-term view, envisioning that by 2030, New Zealand's infrastructure is resilient and coordinated and contributes to economic growth and increased quality of life. If New Zealand is to achieve such a goal, it is critical to adopt assessment methodologies that reflect this long-term strategy. This requires sensible judgments on the value of benefits accrued in the future. Aligning New Zealand's social discount rate policy with the rest of the world is a critical component of improving the living standards for New Zealand. Without a change to our discount rate policy, we are more likely to continue to fund projects that return mediocre growth in the long term.



Source: NZIER and Parker (2009)

Figure 6: Comparison to international approaches

⁵ World Economic Forum, The Global Competitiveness Report 2009-2010, September 2009

Changing the New Zealand Discount Rate

The 8% social discount rate is the default discount rate provided by Treasury. In 2008 it was lowered from 10%, the first change in the discount rate for about 30 years.

Individual sectors are able to engage the Treasury to determine a sector-specific social discount rate (for instance, the New Zealand energy sector uses a social discount rate of 5%). There would not seem to be an *a priori* case for transport to warrant a different approach to social discount rate policy than other infrastructure sectors, nor for Auckland appraisals to differ from other regions. So, it is likely that any attempt to change the social discount rate would be an attempt to change New Zealand's social discount rate policy generally. It would need to involve, at a minimum, Ministerial engagement within the portfolios of Finance, Infrastructure and Transport. Any decision on the New Zealand social discount rate will remain with Treasury and the New Zealand Government. By undertaking this research and engaging with central government officials, a wider view on the potential benefits of a different approach can be discussed and alternative options considered by government officials.

Significance of Decision

This paper does not trigger the significance policy, however its potential implications, should there be a change in central government policy, could be significantly positive.

Consultation

Officials from Economic Development have engaged with a wide range of experts in infrastructure funding and provision from the private sector and industry organisations in the development of this report.

Local Board Views

Should further work be agreed to, Local Boards will be consulted once it is clear what impact a different social discount rate could have on projects within each Local Board area.

Maori Impact Statement

The timely provision of infrastructure would be of benefit to Maori as well as the wider community. Infrastructure improves the extent to which communities can connect with and engage in a city economy. Tangata whenua within the region are potentially significant partners in infrastructure provision, for example through PPPs, and therefore changes in the social discount rate could have a positive impact on their ability to engage in major economic and social infrastructure projects.

Financial and Resourcing Implications

No immediate implications.

Legal and Legislative Implications

No immediate legal and legislative implications.

Implementation Issues

Any implementation issues would be addressed as part of the further work proposed.

Attachments

No.	Title	Page
A	NZIER, August 2011 'Valuing the future appropriately: Case for the shadow price of capital in social discount rate policy'	21