BENEFITS FRAMEWORK TECHNICAL PAPER

A technical paper prepared for the Investment Decision-Making Framework Review

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A new benefits framework has been developed to show how benefit information is used in planning and reporting. The framework allows both benefits and disbenefits to be identified, forecast and measured.

The framework is mode neutral and aligns with the Ministry of Transport's Transport Outcomes Framework. The framework will be used in business cases, when recording information in Transport Investment Online (TIO) about new activities, and when reporting on benefits that are realised.

The investment performance measures (the benefit measures) are the quantitative component of the framework. The set of 52 measures and associated centralised data provide the basis for an evidence-based approach to identifying transport problems, assessing and prioritising investment, and tracking benefits realisation into the future.

The benefits framework will apply from 1 July 2020. The measures are currently being applied. Data and benefit information will be updated on an ongoing basis.

BENEFITS FRAMEWORK

Background

The Investment Decision-Making Framework (IDMF) Review will ensure that Waka Kotahi NZ Transport Agency is able to consider the full range of costs and benefits relevant to investment decision making. The Transport Agency has now developed a framework to categorise and describe the various contributions of land transport to the wellbeing of New Zealanders. In addition to impacts on journey times and travel costs, transport investment affects human health, social cohesion, environmental sustainability and urban design. To provide a system-based approach and long-term view on the benefits of land transport, the framework is aligned with the Ministry of Transport's (MoT) Transport Outcomes Framework (TOF) as well as the New Zealand Treasury's Living Standards Framework (LSF).

Decision makers will be presented with:

- Benefits that cannot easily be measured, for example impacts on community cohesion, so are expressed in descriptive terms (qualitative),
- Benefits that can be expressed in numerical terms, for example the proportion of people that use public transport (quantitative), and
- Benefits that can be assessed in dollar terms, for example wider economic benefits – imperfect competition (monetised).

In most cases monetised benefits may also be expressed as quantitative measures. The use of one does not exclude the other.

To support this approach, the Transport Agency must be clear about which benefits can be assigned monetised values and which are more suited to qualitative or quantitative measurement.

Benefits Management in the Transport Agency

The Treasury defines benefits as the measurable improvement from an outcome perceived as an advantage by one or more stakeholders. An outcome is the change occurring as a direct result of change initiatives (NZ Treasury 2017).

Benefits management includes the identification, analysis, planning, realisation and reporting of benefits. The aim of benefits management is to:

- Ensure value for money.
- Demonstrate how an investment will achieve its intended aims.
- Ensure benefits are realistic and achievable.
- Track the realisation of benefits following project implementation.
- Embed lessons learned in order to continually improve.

Benefits are identified as part of business case development - initially within the Point of Entry and Strategic Business Case. Figure 1, below, outlines the various components of benefits management and investment decision-making identifying four phases of benefits management (identification, analysis, planning and realisation/reporting).

Benefit identification is also required as part of both options appraisal (Economic Case) and benefits management planning (Management Case). It seeks to identify and describe potential impacts arising from transport investment options. Systems thinking, as part of the IDMF, requires that options be designed to address a problem or take advantage of an opportunity, which may be preventing or enabling the achievement of transport system targets.

Currently, economic appraisal of options is performed through Cost Benefit Analysis (CBA). The Economic Evaluation Manual (EEM) provides details of how to complete this assessment, providing technical guidance with a focus on monetised estimates. The EEM's primary function is to provide consistency, transparency and comparability in valuing investment impacts.

Complementing the EEM is the Transport Agency's measurement of investment performance, which seeks to determine whether investments have achieved their intended benefits. Investment performance measures are used to identify and measure the impacts of investment. This includes developing an approach to evaluation during the planning phase and monitoring the actual impact after delivery (ex-post).

Figure 1 Benefits Management in the Transport Agency
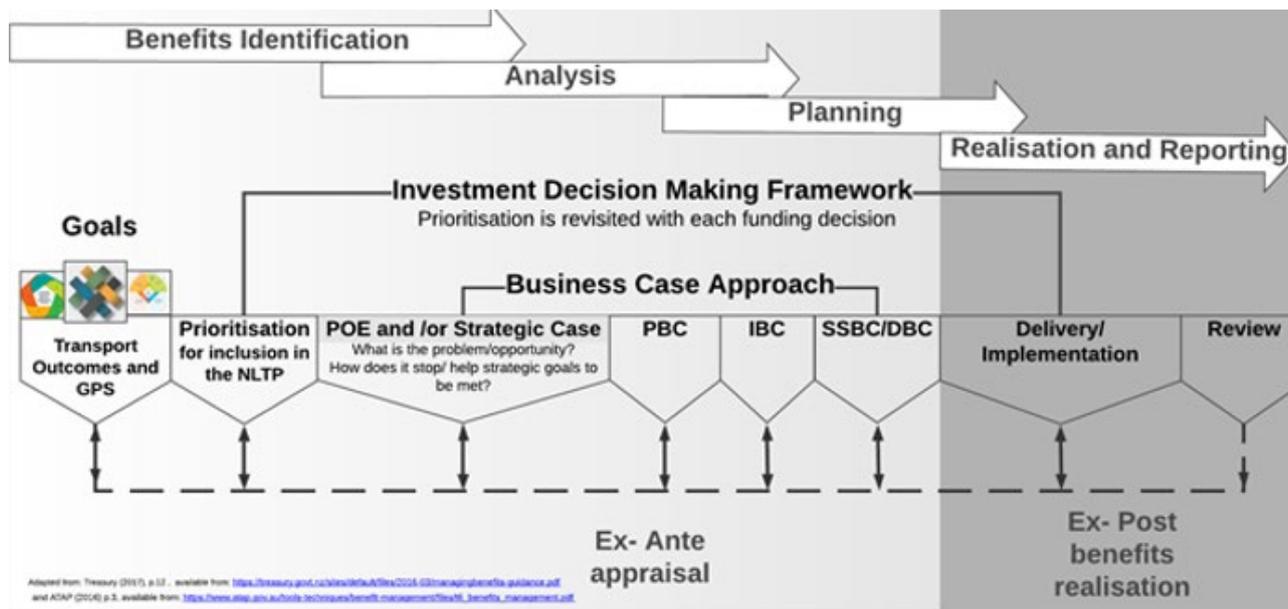
Benefits Framework

Problem

To date, the four phases of benefits management have drawn on different inputs and applied predominantly separate methodologies. The phases are performed using different information and for different purposes.

The EEM and framework for investment performance, for example, do not reference the same set of underlying potential benefits. In addition:

- Different language is used to describe the same benefits.
- Tools and guidance are not aligned to the MoT TOF.
- Some benefits terminology is not mode neutral (e.g. *driver* frustration benefits).
- Some benefits terminology is not direction neutral (e.g. vehicle emission *reduction* benefits).

Solution

The Transport Agency has developed a common benefits framework for use across the entire IDMF process. These benefits are mode neutral and aligned to the MoT's TOF. High level benefit clusters have been developed to provide high-level categories and frame specific benefits measured.

Although intended to be comprehensive, this list of benefits is intended to help rather than restrict local decision-making or business case development. The Transport Agency will continue to support consideration of wider organisational, behavioural or cross-sectoral benefits where relevant and appropriate.

The benefits framework complements the Transport Agency's move towards comprehensive appraisal of all relevant costs and benefits, including impacts that cannot be monetised. The proposed new Appraisal Summary Table (AST) – refer to the IDMF Assessment design report - considers non-monetised impacts in economic assessment alongside monetised benefits and costs drawing from the benefits framework.

New benefits framework

In summary, the new benefits framework:

- is aligned with the Ministry of Transport's TOF;
- will be used in all stages of benefit management from benefits identification through to option appraisal and benefits realisation post-implementation;
- includes of monetised, quantitative and qualitative benefits;
- captures benefits to people, society and the environment;
- is mode neutral.

Table 1 sets out the framework.

The list of benefits is reproduced below:

- Impact on social cost and incidents of crashes
- Impact on system safety
- Impact on perception of safety and security
- Impact on physical and mental health
- Impact of air emissions on health
- Impact of noise and vibration on health
- Impact of system reliability
- Impact on system vulnerabilities and redundancies
- Impact on user experience of the transport system
- Impact on network productivity and utilisation
- Impact on the wider economy
- Impact on greenhouse gases (GHG)
- Impact on natural and built environment
- Impact on water
- Impact on land (Biodiversity)
- Impact on resource consumption
- Impact on mode choice
- Impact on access to opportunities
- Impact on Place and Liveability
- Impact on Te Ao Māori and other cultural values
- Impact on Community Cohesion

In the left-hand columns of Table 1, the benefits are organised in "clusters" (e.g. human health comprising: impact on physical and mental health; impact of air emissions on health; and impact of noise and vibration on health) which facilitates mapping to the TOF.

In the central columns, the benefits are mapped against the monetised and other measures from the EEM. Colour coding illustrates gaps in the current EEM measurement framework and when these are likely to be filled. The right-hand columns map the benefits to the full set of investment performance measures, including a new systematic numbering system.

Where it will be used

The benefits framework is intended for use by all business case practitioners across the land transport system, including local authorities and other co-funders. As noted above, the list of benefits within the framework provides a set of standard and consistent measures, without restricting practitioners from considering other benefits or measures where appropriate.

The benefits framework will be applied at a number of stages and tools within investment decision-making:

- Point of entry and Strategic case (problem identification and ILM)
- Economic case (options assessment and appraisal)
- Management case (benefits management planning)
- Multicriteria analysis
- Early Assessment Sifting Tool (EAST)
- Appraisal Summary Table (AST)
- Investment prioritisation
- Benefits realisation reporting

Manuals

The EEM is currently being refreshed and will be renamed as the Monetised Benefits and Costs Manual. It will continue to be the Transport Agency's standardised guidance for assessing the monetised impacts of proposed activities.

A new manual on non-monetised (quantitative and qualitative) benefits will be developed to provide guidance on the definition and available data for each of the non-monetised benefits, alongside information on how to use the measures.

Investment performance measures

The benefits framework provides a common and enduring set of quantitative measures for application across the investment decision making process. This supports a consistent and coherent approach to benefits identification, assessment, prioritisation and realisation measurement activity. The Transport Agency will continue to support consideration of wider organisational, behavioural or cross-sectoral benefits where relevant and appropriate.

There are currently 52 quantitative investment performance measures split over the 12 benefit clusters, with a large proportion of them associated with benefits in the Inclusive Access outcome (Table 1). Although primary associations are shown in the table, the quantitative measures might provide evidence of more than one benefit. For example, 10.2.1 'mode share' might be used as evidence for a number of the benefits, although only its primary association is shown in this table. Guidance as to the application of these measures is currently in development. Forecasting methodologies for the quantitative benefits will be published to support their use in the assessment process alongside the forecast monetised benefits.

Twelve of the measures are listed as 'user to define'. As detailed in Table 1, work is underway to define specific quantitative metrics for these areas. It is expected that the investment performance measures will evolve over time to better provide evidence of the new benefits framework.

Centralised data is being gathered for each measure, where possible, to enable the pre-population of baseline of measures and the tracking of changes over time. Work is being done in Transport Investment Online (TIO) to better record location of investment so that transfer can be enabled between systems.

An internet-based tool (storymaps) is currently being rolled out to Approved Organisations and key stakeholders that provides geospatial information and data for the measures for which the Transport Agency currently holds centralised data. Through planned capability-building interventions, it is expected that the availability of focused, centralised data for the benefits measures will contribute to evidence-based identification of transport problems and decision making.

Table 1 – Benefits Framework

MoT TOF	Benefit cluster	Benefit	Economic Evaluation Manual – monetised/qualitative benefit measures				Investment Performance Measures – quantitative and qualitative measures					
			Currently in EEM as Monetised, Identified or Unidentified	Feasible shift 2019-2020 Monetised/updated valuation Qualitatively described		Potential shift, 2020 Onwards Monetised/updated valuation Qualitatively described	Quantitative Qualitative				Shift to quantitative measure (19/20)	Centralised data availability (as at November 2019)
				In house	Out source		Old No.	New No.	Name	Description		
Healthy and safe people	1. Changes in user safety	1.1 Impact on social cost and incidents of crashes	Crash cost savings (Social cost of crash)			The EEM parameters value research	21	1.1.1	Collective risk (crash density)	Average annual fatal and serious injury crashes per kilometre of road section		Y (partial)
							22	1.1.2	Crashes by severity	Number of crashes by severity		Y
							23	1.1.3	Deaths and serious injuries	Number of deaths and serious injuries		Y
			Driver frustration reduction benefits				24	1.1.4	Personal risk (crash rate)	Average annual fatal and serious injury crashes per 100 million vehicle-kilometres		Y (partial)
		1.2 Impact on a safe system	n/a	-			25	1.2.1	Road assessment rating – roads	Infrastructure risk rating		Y (partial)
							26	1.2.2	Road assessment rating – state highways	KiwiRoad Assessment Programme (KiwiRAP) star rating (for state highways)		Y (partial)
							27	1.2.3	Travel speed gap	Difference between safe and appropriate speed, and actual speed (under development)		Y (partial)
	2. Changes in perceptions of safety	2.1 Impact on perceptions of safety and security	-				28	2.1.1	Access – perception	Perception of safety and ease of walking and cycling		Y (partial)
	3. Changes in human health	3.1 Impact of mode on physical and mental health	Walking and cycling health benefits			The EEM parameters value research	20	3.1.1	Physical health benefits from active modes	User to describe	'Active modes' is an area of particular focus in relation to liveability and urban development and a measure has not yet been defined concentrating on the impact of active modes, an important social and community benefit of investment in active mode programmes and infrastructure. Other modes and health also need to be considered in the measure development.	N
		3.2 Impact of air emissions on health	Vehicle emission reduction benefits (Air pollutants)	Using the latest version of the VEPM			14	3.2.1	Ambient air quality – NO2	Concentration of NO_2 in µg/m³		Y
							15	3.2.2	Ambient air quality – PM10	Concentration of PM10 in µg/m³		Y
		3.3 Impact of noise and vibration on health	Other external benefits (Noise)		Using the interim results of the lit review as part of an empirical research contracted out by the Agency's research team	Using the final results of the empirical research contracted out by the Agency's research team	13	3.3.1	Noise level	Noise level in dB Laeu (24h)		N
			Other external benefits (Vibration)									
Resilience and security	4. Changes in unplanned disruptive events on social and economic opportunities	4.1 Impact of system vulnerabilities and redundancies	Risks reduction benefits (Natural/ environmental risks- e.g. water flows)			Two resilience research contracted out by the Agency's research team.	49	4.1.1	Availability of a viable alternative to high-risk and high-impact route	Percentage of high-risk, high-impact routes with a viable alternative		Y (partial)
			Risk reduction benefits (Human-made risks)				50	4.1.2	Level of service and risk	User to describe	A project is underway to add to the existing LMTA work on 'Kilometres of road and rail infrastructure susceptible to coastal inundation with sea level rise', a measure that has been identified as one aspect of this user to define	N

										measure. The new research focuses on state highways and rail and its scope expands beyond sea level rise to other associated climate change impacts, such as storm surges and floods. There is also a project underway that is identifying the key resilience risks (risks to level of service) in the transport sector.	
Economic prosperity	5. Changes in transport costs	**5.1 Impact on system reliability**	Journey time reliability benefits			The EEM parameters value research	5	5.1.1	Punctuality – public transport	Percentage of scheduled service trips between 59 seconds before and 4 minutes 59 seconds after the scheduled departure time of selected point		N
							6	5.1.2	Travel time reliability – motor vehicles	Coefficient of variation; standard deviation of travel time DIVIDED BY average minutes travel time (as per Austroads)		N
							11	5.1.3	Travel time delay	Difference between average travel time A and average travel time B in minutes per kilometre		N
							52	5.1.4	Temporal availability – road	Number and duration of resolved road closures: urban >=2 hours; rural >=12 hours		Y
		5.2 Impact on network productivity and utilisation	Travel time saving			The EEM parameters value research	1	5.2.1	Spatial coverage – freight	Percentage completion of the strategic high productivity motor vehicle freight network		Y
			Vehicle operating cost savings				7	5.2.2	Freight – mode share value	Number of vehicles TIMES average load per vehicle in NZD, expressed as percentages		Y (partial)
			Parking user cost savings				8	5.2.3	Freight – mode share weight	Number of vehicles TIMES average load per vehicle in tonnes, expressed as percentages		Y (partial)
			Walking and cycling cost savings				9	5.2.4	Freight – throughput value	Number of vehicles TIMES average load per vehicle in NZD		Y (partial)
							10	5.2.5	Freight – throughput weight	Number of vehicles TIMES average load per vehicle in tonnes		Y (partial)
							29a	5.2.6	Access to key economic destinations (all modes)	Proportion of population living within travel threshold (15 minutes, 30 minutes or 45 minutes) of key social and economic opportunities (including work) by different modes (walking, cycling, public transport, private motor vehicle) in the morning peak		Y
	6. Wider economic impact	**6.1 Wider economic impact (productivity)**	(WEB) Productivity				Nil					
		6.2 Wider economic impact (labour supply)	(WEB) Labour supply									
		6.3 Wider economic impact (imperfect competition)	(WEB) Imperfect competition									
		6.4 Wider economic impact (regional economic development)	(WEB) Regional economic development (including tourism)	Using technical note on tourism								
		6.5 Wider economic impact (Land use change)	(Dynamic WEB) Land use change	Using technical note on tourism								
Environment	7. Changes in natural environment	**7.1 Impact on water**	External benefits (Water quality and flows)				16	7.1.1	Water quality	User to describe	Both the development of a measure and the data to feed it is under development and builds on research and methodology	N

											development contained in NZTA Research Report 585 'Risk assessment of road stormwater run-off'. Work in 19/20 will focus on capturing and 'cleaning' input data, model development as well as end user testing. Further work is likely in 20/21 to finalise the development phase of the model / tool before work on the model moves to an update and maintain phase.	
		7.2 Impact on land (Biodiversity)	Other external benefits (Ecological impact) Other external benefits (Special area)				12	7.2.1	Biodiversity	User to describe	From a land transport system perspective one of the more appropriate biodiversity measures is likely to relate to habitat connectivity / severance (primarily terrestrial and freshwater habitat). Initial work needs to focus on understanding where the land transport system interfaces with Significant Natural Areas to understand the scale of potential impacts. Once this is known, work can then focus on understanding the state of the habitat and the impact that land transport has on that habitat.	N
	8. Changes in climate	8.1 Impact on GHG	Vehicle emission reduction benefits (GHG emissions)		Using the results of a desktop research		17	8.1.1	CO_2 emissions	Tonnes of CO2 equivalents emitted		Y
							18	8.1.2	Resource consumption	User to describe	Potential research may be required about precedents for the best way to measure vehicle occupancy (and whether technological options are now available) and the best measures in general to provide evidence of impact of changing mode on greenhouse gas emissions.	N
	9. Changes in resource consumption	9.1 Impact on resource consumption	n/a				19	9.1.1	Resource consumption	User to describe	Work is underway to determine appropriate resource and energy efficiency measures for inclusion in the Sustainability Monitoring Framework. This work will also inform state highway contract KPI's and this measurement set.	N
Inclusive access	10. Changes in access to social and economic opportunities	10.1 Impact on user experience of the transport system	Driver frustration reduction benefits Seal extension benefits User benefits from new or improved facilities and services (walking, cycling and PT)			The EEM parameters value research	3	10.1.1	People – throughput of pedestrians, cyclists and public transport boardings	Number of pedestrians, cyclists and public transport boardings		Y
							28	10.1.2	Access – perception	Perception of safety and ease of walking and cycling		Y
							31	10.1.3	Pedestrian delay	Pedestrian time lost due to intersection delay		N
							39	10.1.4	Ease of getting on/off public transport services	Percentage of low floor and wheelchair accessible services		N
							40	10.1.5	Network condition – cycling	Percentage travel on cycle network classified as complying with defined level of service (facility type)		N
							41	10.1.6	Network condition – road	Percentage travel on road network classified as smooth as per defined level of service		N
							44	10.1.7	People – throughput	Number of pedestrians, cyclists, public transport boardings and motor vehicles (excl. public transport) TIMES average number of people per vehicle		N
							45	10.1.8	People – throughput (UCP)	Number of pedestrians and cyclists		N
							47	10.1.9	Traffic - throughput	Number of pedestrians, cyclists and motor vehicles by vehicle type		Y
							48	10.1.10	Travel time	Average travel time in minutes		N

		10.2 Impact on mode choice	-				2	10.2.1	People – mode share	Number of pedestrians, cyclists, public transport boardings, and motor vehicles (excl. public transport) TIMES number of people per vehicle, expressed as percentages		N
							18	(Repeat) 8.1.2	Mode shift from single occupancy private vehicle	User to describe	See 8.1.2	N
							30	10.2.2	Accessibility – public transport facilities	Number of bus or train stops that are fully accessible		N
							32	10.2.3	Spatial coverage – cycle lanes & paths	Percentage completion of the strategic cycle network		Y
							33	10.2.4	Spatial coverage – cycling facilities	Number of people living within 500m of a high quality cycling facility		N
							34	10.2.5	Spatial coverage – public transport – employees	Number of employees within 500m of a bus stop or 1km from a rail or bus rapid transit station		Y
							35	10.2.6	Spatial coverage – public transport – employees	Number of employees within 500m of a bus stop or 1km from a rail or bus rapid transit station		Y
							35a	10.2.6a	Spatial coverage - public transport - new residential dwellings	% of recently built residential dwellings with access to public transport services (subset of number of people living within 500m of a bus stop or 1km from a rail or bus rapid transit station)		N
							36	10.2.7	Temporal availability – public transport	Public transport frequency per hour weighted by percentage of the population living within 500m of a bus stop or 1km from a rail or bus rapid transit station		N
							43	10.2.8	Cost of access to key destinations – all modes	User to describe	A measure is currently under development 'Cost to access key destinations by walking, cycling, public transport and private vehicle' with the description 'Direct financial cost ($ p/km) to the user of walking, cycling, public transport and private vehicle'.	N
							4	10.2.9	Pricing – more efficient	User to describe	Research to be done to determine need and use of a pricing measure.	N
							46	10.2.10	Traffic – mode share (number)	Number of transport users by mode pedestrians, cyclists and motor vehicles by vehicle class, expressed as percentages		Y
							46a	10.2.10b	Traffic – mode share (distance)	Average trip distance per person in urban areas		N
							44	(Repeat) 10.1.7	People – throughput	Number of pedestrians, cyclists, public transport boardings and motor vehicles (excl. public transport) TIMES average number of people per vehicle		N
							45	(Repeat) 10.1.8	People – throughput (UCP)	Number of pedestrians and cyclists		N
							47	(Repeat) 10.1.9	Traffic – throughput	Number of pedestrians, cyclists and motor vehicles by vehicle type		Y
		10.3 Impact on access to opportunities	-		Using the results of a desktop research on the definition of liveability.		29b	10.3.1	Access to key social destinations (all modes)	Proportion of population living within travel threshold (15 minutes, 30 minutes or 45 minutes) of key social opportunities (including		Y

										education, health care, supermarkets) by different modes (walking, cycling, public transport, private motor vehicle) in the morning peak		
11. Māori and cultural values, changes in liveability of places		**11.1 Impact on Te Ao Māori and Māori interests***	Other external benefits (e.g. iwi, Māori values)		Using the results of a desktop research on the Māori values and interests					-	Some research is already underway to inform the qualified assessment of this benefit cluster, but further work will be required to ascertain the best quantitative measures for these new areas of measurement. It is expected this work will dovetail with the continuing definition of liveability and urban development underway in the organisation.	N
		11.2 Impact on natural and built environment	Other external benefits (Overshadowing) Other external benefits (Visual impacts)		Using the results of a desktop research on the definition of liveability.		37	11.2.1	Amenity value – natural environment	User to describe		
							38	11.2.2	Amenity value – built environment	User to describe		
		11.3 Impact on place and liveability	-		Using the interim results of a research on valuing footpath and pedestrian improvements. Using the results of a research on the definition of liveability.	Using the final results of the research on valuing footpath and pedestrian improvements	37	(Repeat) 11.2.1	Amenity value – natural environment	User to describe		
							38	(Repeat) 11.2.2	Amenity value – built environment	User to describe		
12. Changes in community cohesion		**Impact on community cohesion**	Other external benefits (Community severance) Other external benefits (Isolation)		Using the results of a research on the definition of liveability.		42	12.1.1	Social connectedness	User to describe		N

* It is not part of the TOF outcomes but is part of Te Ara Kotahi our Māori Strategy

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