

Road Asset Management (RAM) Training

10-13 August 2020

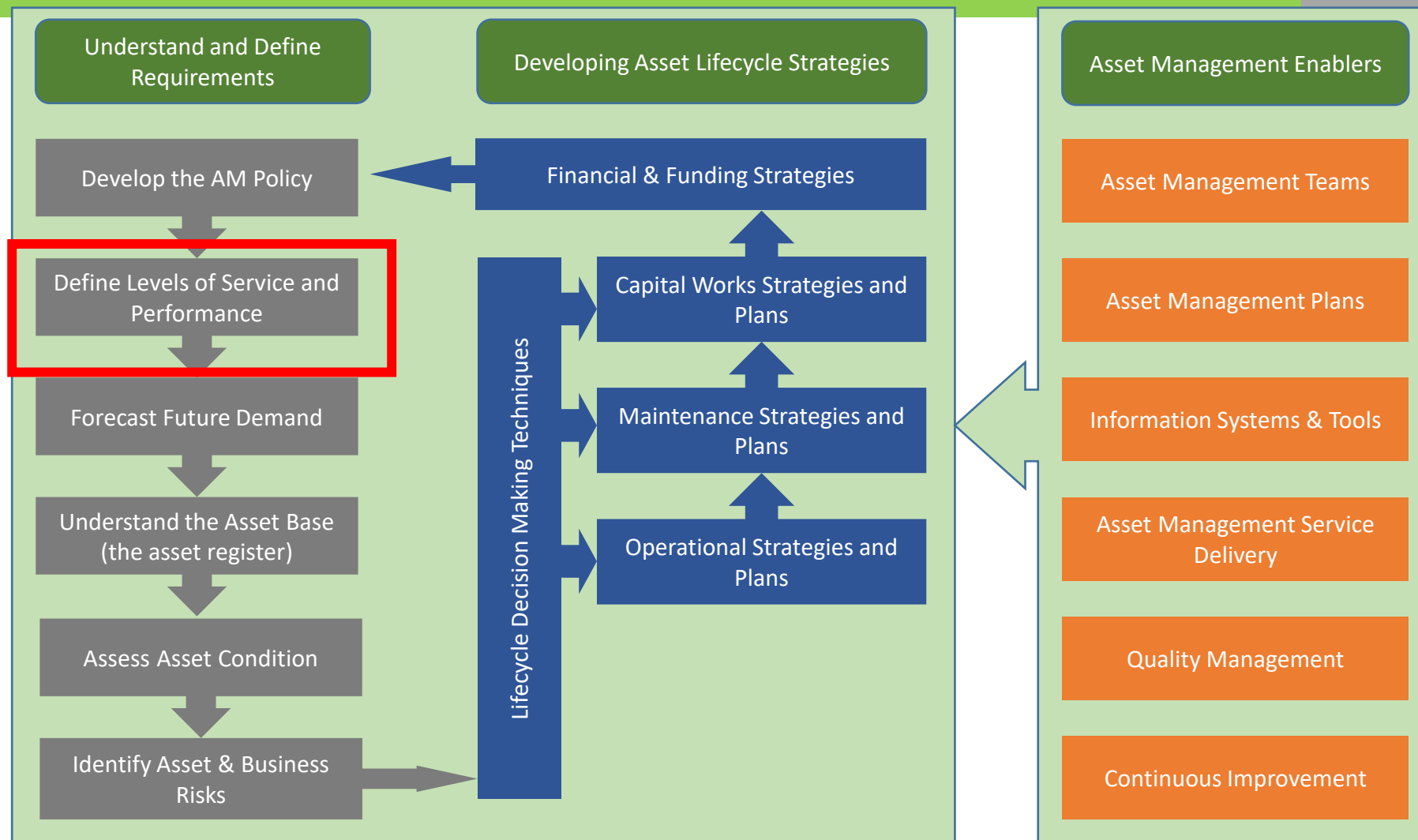
Session 3: Defining Levels of Service & Performance

Dr Ian Greenwood
BE(Civil), PhD(Eng), FEngNZ(Civil), CPEng(NZ)
ian@gaic.nz

Training Sessions

1. Introduction to Road Asset Management
2. Overview of the Components of RAM
- 3. Levels of Service and Performance Measures**
4. Inventory and Condition Data
5. Lifecycle Decisions Making and Funding
6. Asset Valuation
7. Asset Management Plans, Teams and Tools
8. Contracting Models and Impact on RAM

International Infrastructure Management Manual (IIMM) AM Process



Service Levels

- Define what it is that you are trying to deliver, in words that the customer understands
- We don't build roads, rehabilitate roads, or maintain roads for the fun of it, we do that to deliver a service level (whether explicitly stated or not)
- Service levels are about more than just the condition of the road
 - Most authorities mention Efficient, Safe, Informed, Cost-effective in their service level statements

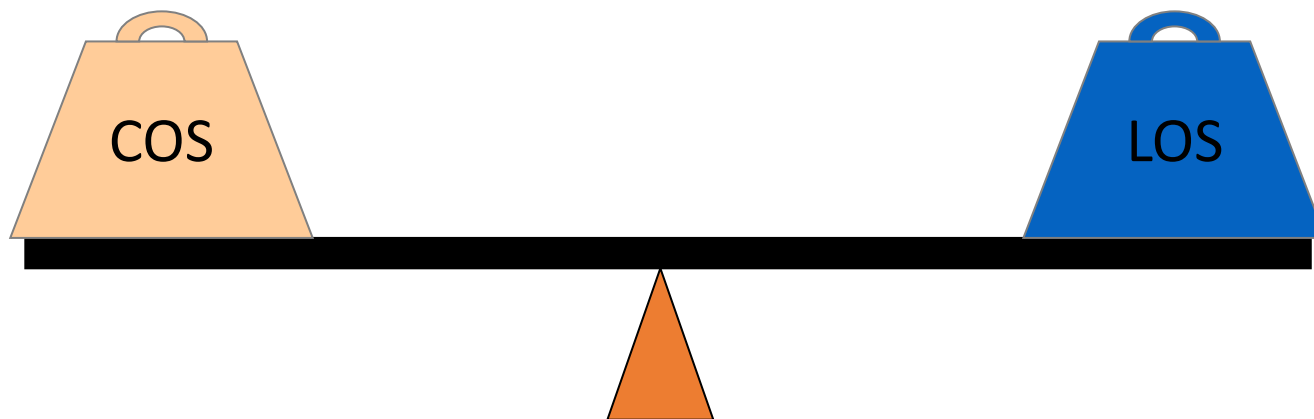
Defining the Level of Service is Critical



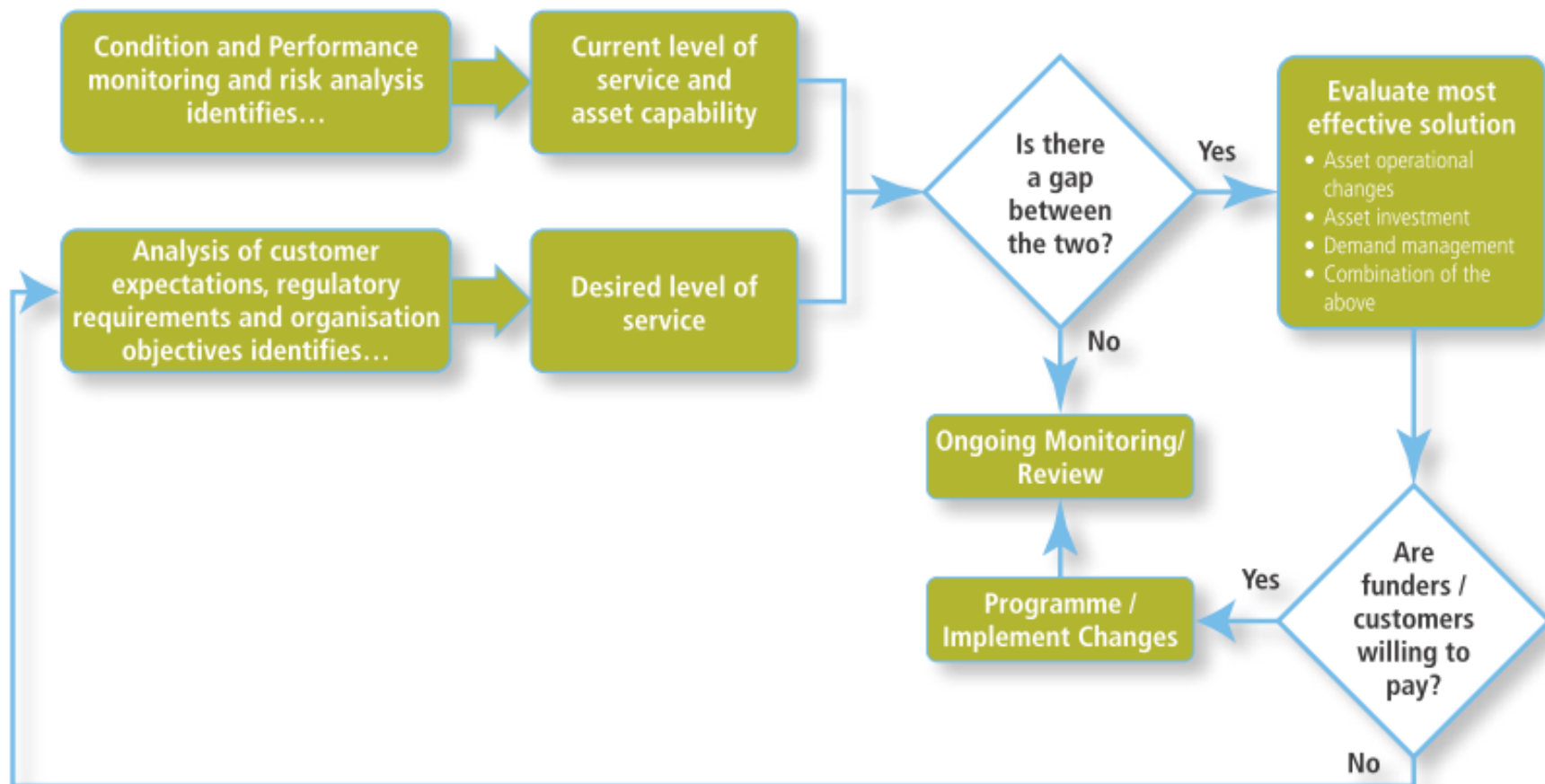
One size doesn't fit all – its all about affordability & risk



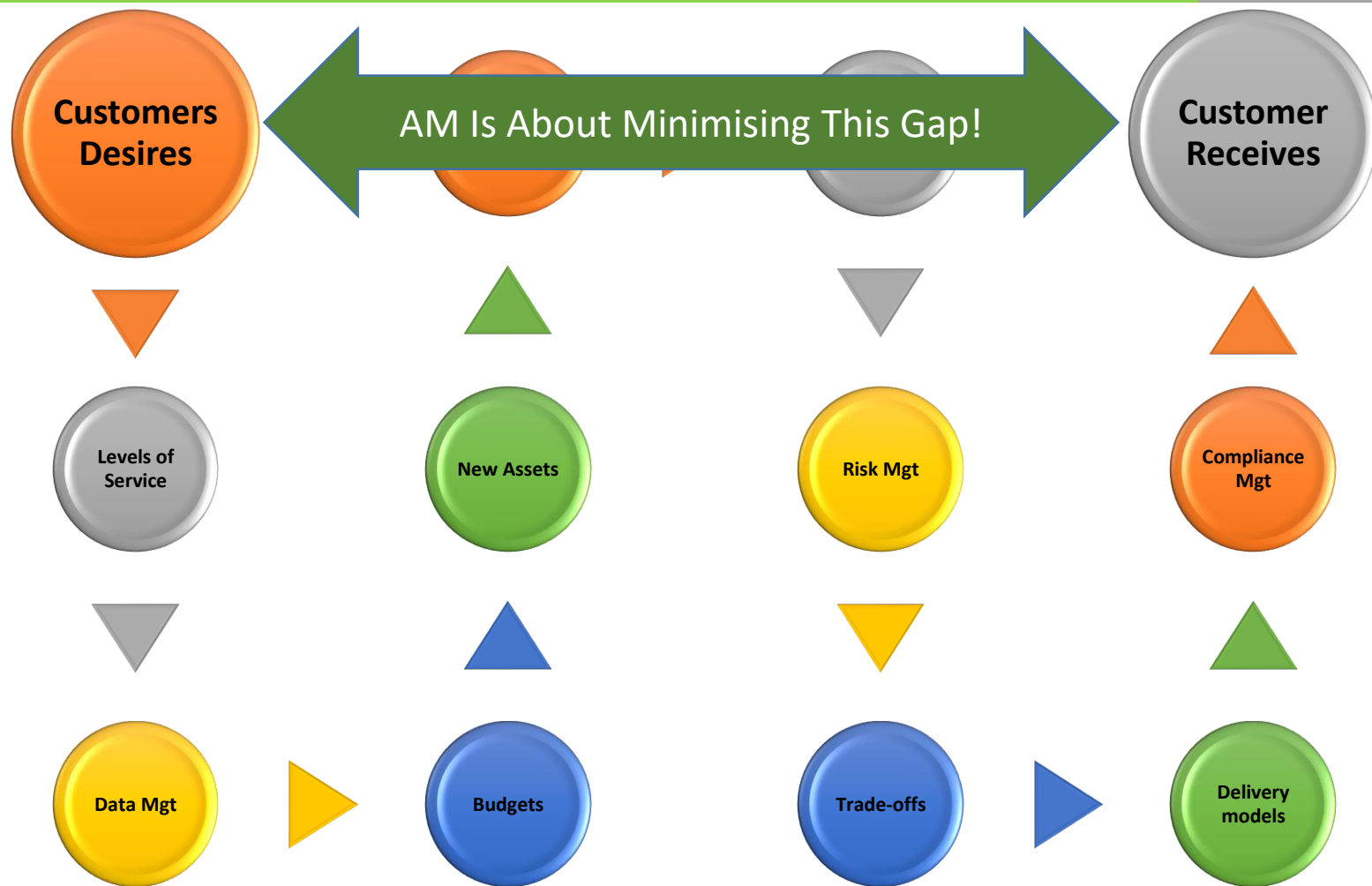
Asset Management is a Business Model



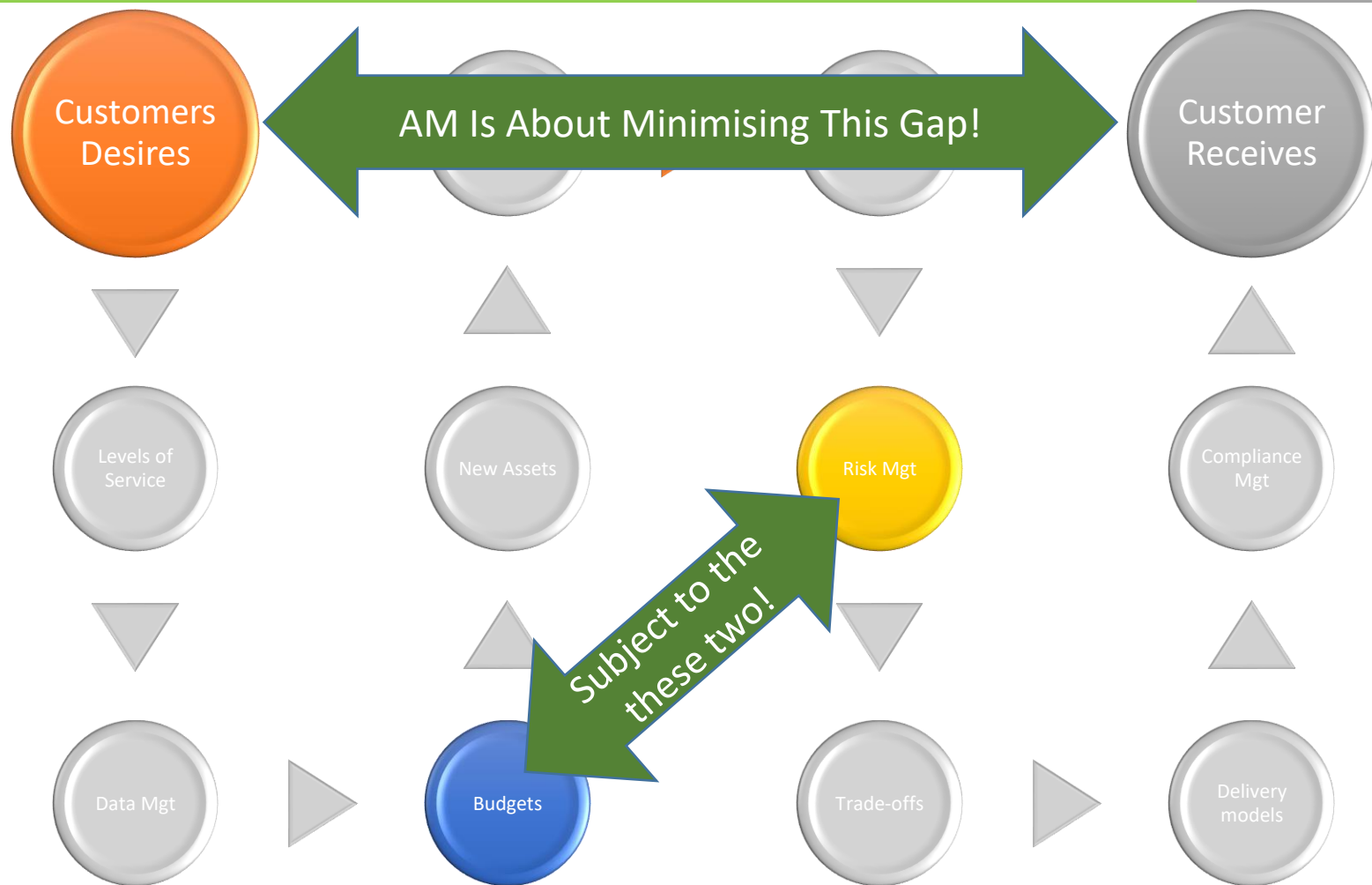
It may called asset management, but assets are only there to deliver a service



In Simple Terms



In Simple Terms



Some key definitions

- Levels of Service

- What the organisation intends to deliver. Levels of service describe one or more attributes of the service from a customer point of view
- Example: Provide a network that connects communities.

- Performance Measure (also termed Performance Indicator)

- A qualitative or quantitative measure of a service or activity used to indicate how the organisation is doing in relation to delivering levels of service
- Example: % of communities > 500 habitats serviced by an all weather road.

Some key definitions

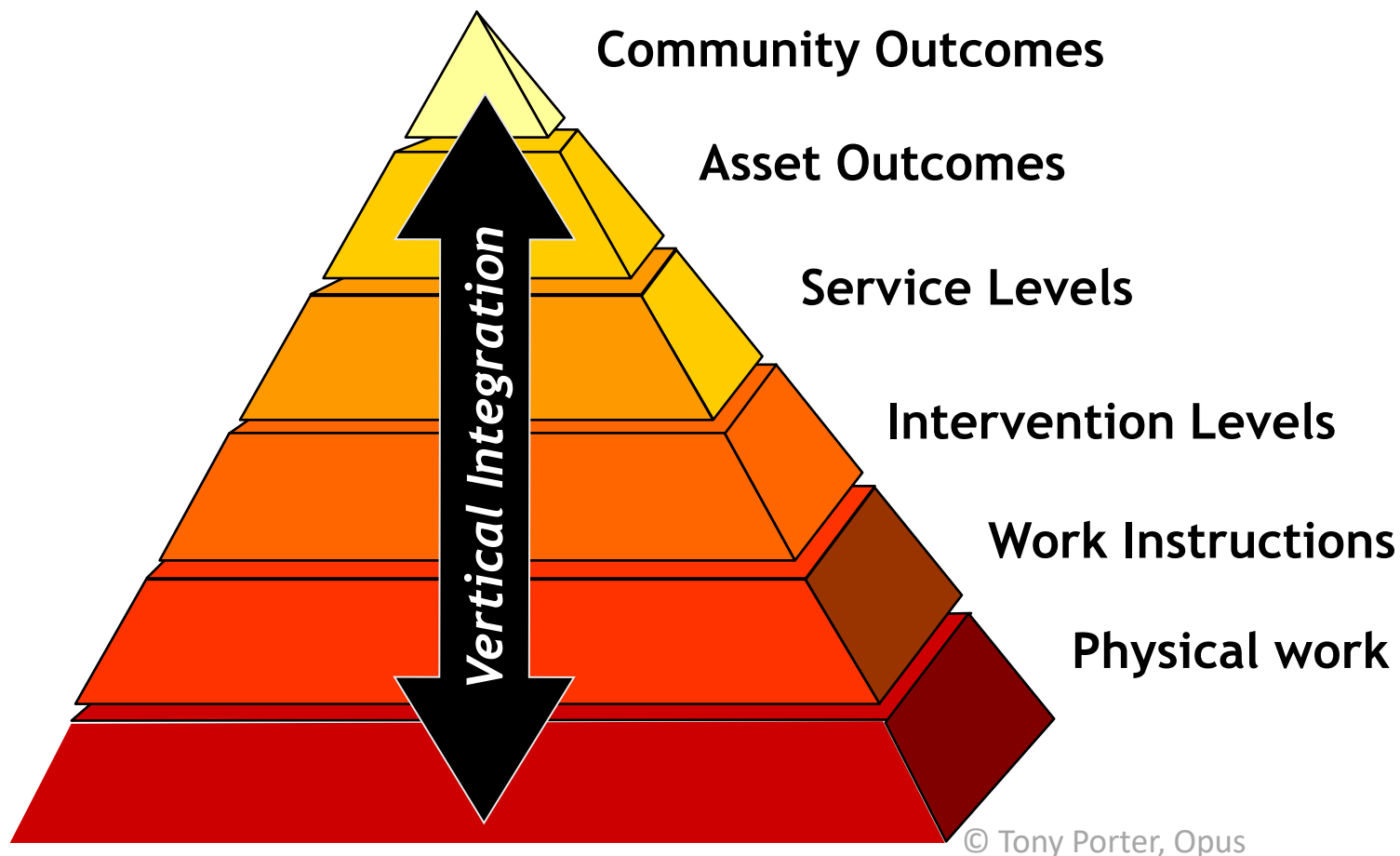
- **Performance Target**

- A specific quantifiable target for performance, used in reference to a performance measure.
- Example: 90% by 2015, 100% by 2020.

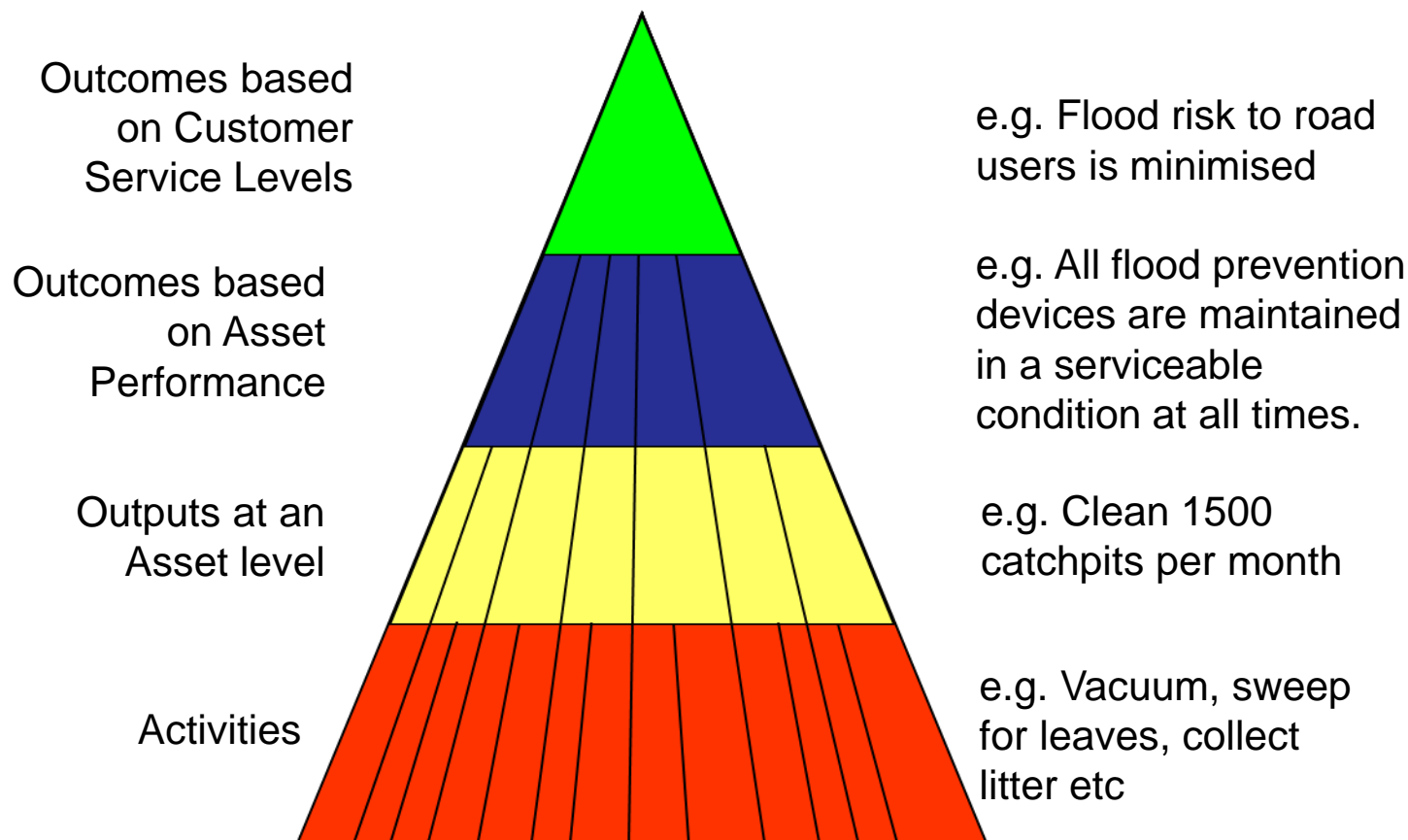
- **Performance Result**

- The quantifiable performance result for a year, used in reference to a performance target.
- Examples: 81% communities serviced by June 2013.

Asset Management Pyramid

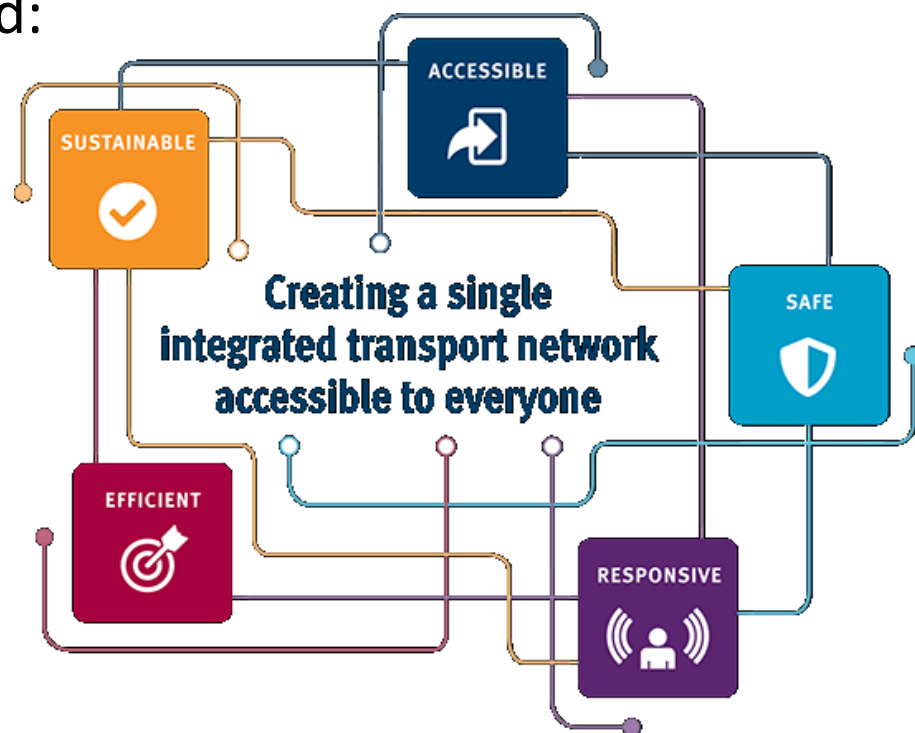


Example of Linkage



Community Outcomes

- These are the outward facing statements of what it is that the road authority is trying to deliver to the road user
- Typically see statements around:
 - Safety
 - Efficiency
 - Reliability
 - Comfort
 - Cost effectiveness
 - Informed
- Often vary by road hierarchy.



Queensland, Dept of Transport and Main Roads

New Zealand One Road Network Classification

- <https://www.nzta.govt.nz/assets/Road-Efficiency-Group-2/docs/customer-levels-of-service.pdf>

Fit for purpose customer levels of service (CLOs) outcomes (provisional)

Overarching principles:						
<ol style="list-style-type: none"> 1. Over time all roads in a particular category should offer an increasingly consistent, fit for purpose customer level of service for road users 2. Value for money and whole of life cost will be optimised in the delivery of affordable customer levels of service. 3. The customer levels of service will be delivered in the context of an integrated national network, integrating landuse and transport, including all modes and both rural and urban areas. 4. The customer levels of service, will be delivered in the context of a safe system approach, which aims to create a forgiving road system, where human error and vulnerability do not result in death or serious injury. 						
[Blue descriptions in square brackets indicate guidance for the AMP Group preparing performance measures and targets and will be removed from the final customer level of service descriptors].						
Road categories	Mobility			Safety	Amenity	Accessibility
	Travel time reliability	Resilience	Optimal speeds (safety and efficiency)			
National (high volume)	The majority of road users experience consistent travel times with some exceptions in major urban centres.	Route or viable alternative is always available. Very rapid restoration of route affecting normal operating conditions. Road users are advised well in advance of issues affecting network performance and availability.	Higher speeds on KiwiRAP 4-star dual carriageway roads, or lower or variable speeds where required to support network safety or productivity. [Priority users (buses and freight) provided with separate facilities where appropriate].	Mostly forgiving roads and roadsides, equivalent to KiwiRAP 4-Star standard. User hazards absent or mitigated including head on risk. Active road users generally do not have access - if present, they are provided with separate space or are physically separated. Form of road provides road user guidance.	High level of comfort, no discernable roughness. Aesthetics of adjacent road environment reflects journey experience needs of higher numbers of through traffic users. Character of scenic/tourist routes protected and enhanced.	Landuse access for road users rare and highly engineered, usually only to highway service centres. Strategic network connectivity for road users due to infrequent connections, generally only to National high volume roads. High-volume traffic will be unimpeded by other traffic at junctions. [Mainly express bus services]. Active road users generally do not have access - if present, they are provided with network access and journey continuity by a separate space or are physically separated. Provision of quality information relevant to national road user needs.
National	The majority of road users experience consistent travel times with some exceptions in urban heavy peak, holiday or during major events.	Route is always available during major weather or emergency events and viable alternatives exist. Rapid clearance of incidents affecting road users. Road users are generally advised in advance of issues and incidents	Higher speeds depending on assessed level of risk. Lower if mixed use, high intersection density, schools, shopping, concentrations of active road users. [Priority users (buses and freight) provided with separate facilities where appropriate.]	A high KiwiRAP 3 or 4-star standard, or equivalent, with consistent and predictable alignment. User hazards mostly mitigated. Active road users (if present) are mostly provided with separate space or are physically separated. Some lower standards and/or winding sections may require lower speeds and extra care. High level of road user safety guidance provided.	High level of comfort, infrequent roughness. Aesthetics of adjacent road environment reflects journey experience needs of higher numbers of through traffic users. Character of scenic/tourist routes protected and enhanced.	Landuse access for road users infrequent and highly restricted in rural areas, and often restricted in urban areas. Mainly strategic network connectivity for road users due to infrequent connections, generally only to other equal and higher category roads. [Mainly express bus services]. Network access and journey continuity for active road users (if present) mostly provided by separate space or physical separation. Easy navigation at intersections, with National road traffic given priority, unless pining with equal or higher category roads. Provision of quality information relevant to national road user needs.
Regional	The majority of road users experience consistent travel times with some exceptions in urban heavy peak, holidays, during major events or during severe weather events.	Route is always available except during major-extreme weather or emergency events and viable alternatives nearly always exist. Rapid clearance of incidents affecting road users. Road users may be advised in advance of issues and incidents	Higher speeds depending on assessed level of risk. Lower if mixed use, high intersection density, schools, shopping, concentrations of active road users. [Priority users (buses and freight) provided with separate facilities where appropriate.]	Mostly KiwiRAP 3-star equivalent or better. Active road users are mostly provided with additional space in urban areas and in some rural areas. Some lower standards and/or winding sections may require lower speeds and extra care. High level of road user safety guidance provided.	High level of comfort, infrequent roughness. Aesthetics of adjacent road environment reflects journey experience needs of both through traffic and active road users. Character of scenic/tourist routes protected and enhanced. Amenity outcomes of active road users are mostly provided with additional space in urban areas and in some rural areas. Clean and secure [lighting, park and ride and cycle park facilities, weather protection for PT users].	Landuse access for road users in rural areas often restricted, and some restrictions in urban areas. Limited road user connections to other National roads and Arterials, with priority over lower category road users. [Numerous busstops with high frequency services to key destinations and interchanges]. Network access and journey continuity for active road users are mostly provided with additional space in urban areas and in some rural areas. [Parking for all modes, and facilities for mobility impaired at activity centres with some shared spaces.] Extra care required around activity centres due to mixed use, including goods vehicles. Provision of quality information relevant to regional road user needs.
Arterial	Generally road users experience consistent travel times with some exceptions in urban heavy peak, holidays, during major events or during moderate weather events.	Route is nearly always available except in major weather events or emergency event and where no other alternatives are likely to exist. Clearance of incidents affecting road users will have a high priority. Road users may be advised of issues and incidents	Higher speeds depending on assessed level of risk. Lower if mixed use, high intersection density, schools, shopping, concentrations of active road users. Road user safety guidance provided at high risk locations. Some separation of road space for active road users in urban areas	Variable road standards, lower speeds and extra care required on some roads/sections particularly depending on topography, access, density and use. Road user safety guidance provided at high risk locations. Some separation of road space for active road users in urban areas	Good level of comfort, occasional areas of roughness. Aesthetics of adjacent road environment reflects journey experience needs of both road users and land use. Urban arterials reflect urban fabric and contribute to local character. Some separation of road space for active road users for amenity outcomes in urban areas. Clean and secure [lighting, good PT and cycle numbers, including park and ride and cycle park facilities, and weather protection for PT users].	Some landuse access restrictions for road users, both urban and rural. Road user connection at junctions with National, Arterial or Collector roads, and some restrictions may apply in urban areas to promote Arterials. Traffic on higher classified roads generally has priority over lower order roads. [Numerous busstops with high frequency services to key destinations and interchanges.] Some separation of road space for active road users in urban areas to provide network access and journey continuity. [Parking for all modes and facilities for mobility impaired at activity centres, and some shared spaces.] Extra care required around activity centres due to mixed use, including goods vehicles. Provision of quality information relevant to Arterial road user needs.

Mobility – TT Reliability, Resilience, Speed

Road categories	Mobility		
	Travel time reliability	Resilience	Optimal speeds (safety and efficiency)
National (high volume)	The majority of road users experience consistent travel times with some exceptions in major urban centres.	Route or viable alternative is always available. Very rapid restoration of route affecting normal operating conditions. Road users are advised well in advance of issues affecting network performance and availability.	Higher speeds on KiwiRAP ² 4-star dual carriageway roads, or lower or variable speeds where required to support network safety or productivity. [Priority users (buses and freight) provided with separate facilities where appropriate].
National	The majority of road users experience consistent travel times with some exceptions in urban heavy peak, holiday or during major events.	Route is always available during major weather or emergency events and viable alternatives exist. Rapid clearance of incidents affecting road users. Road users are generally advised in advance of issues and incidents	Higher speeds depending on assessed level of risk. Lower if mixed use, high intersection density, schools, shopping, concentrations of active road users. [Priority users (buses and freight) provided with separate facilities where appropriate.]
Regional	The majority of road users experience consistent travel times with some exceptions in urban heavy peak, holidays, during major events or during severe weather events.	Route is always available except during major-extreme weather or emergency events and viable alternatives nearly always exist. Rapid clearance of incidents affecting road users. Road users may be advised in advance of issues and incidents	

Safety, Amenity, Accessibility

Safety

Mostly forgiving roads and roadsides, equivalent to KiwiRAP 4-Star standard. User hazards absent or mitigated including head on risk. Active road users generally do not have access - if present, they are provided with separate space or are physically separated. Form of road provides road user guidance.

A high KiwiRAP 3 or 4-star standard, or equivalent, with consistent and predictable alignment. User hazards mostly mitigated. Active road users (if present) are mostly provided with separate space or are physically separated. Some lower standards and/or winding sections may require lower speeds and extra care. High level of road user safety guidance provided.

Mostly KiwiRAP 3-star equivalent or better. Active road users are mostly provided with additional space in urban areas and in some rural areas. Some lower standards and/or winding sections may require lower speeds and extra care. High level of road user safety guidance provided.

Amenity

High level of comfort, no discernable roughness. Aesthetics of adjacent road environment reflects journey experience needs of higher numbers of through traffic users. Character of scenic/tourist routes protected and enhanced.

High level of comfort, infrequent roughness. Aesthetics of adjacent road environment reflects journey experience needs of higher numbers of through traffic users. Character of scenic/tourist routes protected and enhanced.

High level of comfort, infrequent roughness. Aesthetics of adjacent road environment reflects journey experience needs of both through traffic and active road users. Character of scenic/tourist routes protected and enhanced. Amenity outcomes of active road users are mostly provided

Accessibility

Landuse access for road users rare and highly engineered, usually only to highway service centres. Strategic network connectivity for road users due to infrequent connections, generally only to National high volume roads. High volume traffic will be unimpeded by other traffic at junctions. [Mainly express bus services]. Active road users generally do not have access - if present, they are provided with network access and journey continuity by a separate space or are physically separated. Provision of quality information relevant to national road user needs.

Landuse access for road users infrequent and and highly restricted in rural areas, and often restricted in urban areas. Mainly strategic network connectivity for road users due to infrequent connections, generally only to other equal and higher category roads. [Mainly express bus services.] Network access and journey continuity for active road users (if present) mostly provided by separate space or physical separation. Easy navigation at intersections, with National road traffic given priority, unless joining with equal or higher category roads. Provision of quality information relevant to national road user needs.

Landuse access for road users in rural areas often restricted, and some restrictions in urban areas. Limited road user connections to other National roads and Arterials, with priority over lower category road users. [Numerous busstops with high frequency services to key destinations]

Developing Customer Service Levels

- Consultation
 - Focus groups
 - Monitoring of feedback on different road standards
 - Legislative requirements
-
- These should all link to your overall goals and objectives

Lead versus Lag Measures

- Lead – measure the actions you are taking
 - e.g. number of accident black spots addressed per year
 - e.g. time to repair a pothole
- Lag – measure the impact of those actions
 - e.g. number of road deaths per year
 - e.g. roads provide a comfortable travel experience
- Tend to have mainly lag measures at the top, and lead measures at the bottom
- Many road authorities start out with a focus on the lead measures, as these are easier understood by the technical staff of the road authority.

Developing Performance Measures

- Follow the SMART rule
- **S**pecific – clear what is being measured and why
- **M**easurable – ideally using data that is also required for other business purposes
- **A**chievable – neither aspirational or easily achieved
- **R**elevant – supports overall road authority goals and objectives
- **T**imebound – annual or longer term targets are common

Linking Service Levels and Performance Measures

- Often not possible to create a perfect linkage between customer based service level, and technical performance measures
 - Look for reasonable linkage
- Attribution is an issue
 - i.e. crash rate is not 100% in the road authorities control
 - Drink driving, speeding, vehicle quality all play a role
 - Don't reduce the target based on some view of road authorities control
 - The road user wants to be safe, doesn't matter what the cause of the safety deficiency is.

Example Framework

- Highways England
- <https://www.gov.uk/government/publications/highways-englands-2017-to-2018-performance-monitoring-statements>

Tab	Description
Performance Specification statements	
PS1	Making the network safer
PS2	Improving user satisfaction
PS3	Supporting the smooth flow of traffic
PS4	Encouraging economic growth
PS5	Delivering better environmental outcomes
PS6	Helping cyclists, walkers, and other vulnerable users of the Network
PS7	Achieving real efficiency
PS8	Keeping the network in good condition
Investment Plan statements	
IP1	Detailed analysis of enhancement monitoring milestones dates
IP2	Strategic studies deliverables
IP3	Ring-fenced investment funds
IP4	Renewal volume reporting

Financial Performance Statements	
F1	Total income and expenditure
F2	Resource Income and expenditure
F2.1	Regional resource income and expenditure
F2.2	Maintenance resource income and expenditure
F2.3	Renewals resource income and expenditure
F2.4	Private Finance Initiative (PFI) income and expenditure
F2.5	General operations income and expenditure
F2.6	Traffic management resource income and expenditure
F2.7	Support costs
F2.8	Other project activities income and expenditure
F3	Capital expenditure
F3.1	Regional capital income and expenditure
F4	Analysis of protocols expenditure

Highways England - example

1	Highways England Performance Monitoring Statements Year end 2017-18									
2	Statement PS8: Keeping the Network in good condition			For a definition of the metric and parameters for measuring and monitoring performance regarding network condition see Highways England's Operational Metrics Manual						
3	Performance specification									
4				Annual			Cumulative	Cumulative	Cumulative	
5		Source of baseline	Actual	baseline	KPI/PI/Req	Difference	Actual	baseline	KPI/PI/Req	Difference
6	KPI									
7	Pavement									
8	The percentage of pavement asset that is in a condition that does not require further investigation for possible maintenance to be maintained at 95% or above						In 2017-18, Highways England achieved a year-end actual of 95.2%, 0.2pp above target, performance has continued to improve since the low point of 2015-16, rising by 2.9pp from the re-baselined figure of 92.3%. This signifies the positive impact of our ongoing recovery and performance improvement work.			
9	2011-12	Historic Data	95.60%							
10	2012-13	Historic Data	96.40%							
11	2013-14	Historic Data	95.20%							
12	2014-15	Historic Data	94.90%				Over the last two years Highways England has delivered additional renewals to ensure alignment between our renewals programme and KPI target. Highways England delivered 15 lane km as part of a recovery plan in 2016-17 and subsequently completed another 15 km of resurfacing in addition to the planned renewals programme in 2017-18.			
13	2015-16	Corporate management information	*95.40%	95%	KPI	0.40%				
14	2016-17	Corporate management information	94.30%	95%	KPI	-0.70%				
15	2017-18	Performance specification	95.20%	95%	KPI	0.20%				
16	2018-19	Performance specification	X	95%	KPI	X	*Additional data was received in May 2016 and subsequently validated in June 2016, resulting in a reduction in the published year-end performance figure (of 95.4%) to 92.3%. For consistency with the 2016-17 Annual Report & Accounts, the original validated figure has been shown with a statement acknowledging the re-baselined figure of 92.3%.			
17	2019-20	Performance specification	X	95%	KPI	X				
18										
19	PIs									
20							Asset measures have remained stable since 2016-17.			
21	Geotechnical asset inventory & geotechnical asset risk level (condition)									
22	Length of the network for which a geotechnical inventory survey has been completed (km)						All Geotechnical inspections have been carried out as planned in year. The performance over the baseline period of 2010-15 is largely stable, with the increase in survey length and length of network keeping pace.			

PS3 - Traffic Flow

PS4 - Economic growth

PS5 - Environment

PS6 - Vulnerable Users

PS7 - Achieving real efficiency

PS8 - Network in good condition

IP1

IP2

Highways England - example

- PS8 – Keeping the Network in Good Condition
- Key Performance Indicator (KPI)
 - Pavements
 - % of network that does not require investigation of further maintenance to be $\geq 95\%$
- Performance Indicators
 - Geotechnical asset inventory and geotechnical asset risk level
 - Length of network with geotechnical inspections completed
 - % of geotechnical assets with low risk
 - Drainage asset – inventory and condition data coverage
 - % of network with drainage data in AMIS
 - % of drainage network with condition data
 - Technology
 - ...
 - Structures
 - Average SCI
 - Critical element

Auckland Transport - example

OUR GOALS AND LEVELS OF CUSTOMER SERVICE

RESILIENCE

OUR GOAL: unplanned road closures are rare, and alternative routes are signposted when they do occur.

2018 result: all road closures had detours in place.

The last time residents were cut off completely from the road network was on parts of Great Barrier Island for a few days following a major storm in June 2014.



ACCESSIBILITY

OUR GOAL: freight network is accessible to trucks.

2018 result: All bridges and carriageway on major freight routes are accessible to Class 1 heavy trucks.



DRIVER COMFORT (ROAD SMOOTHNESS)

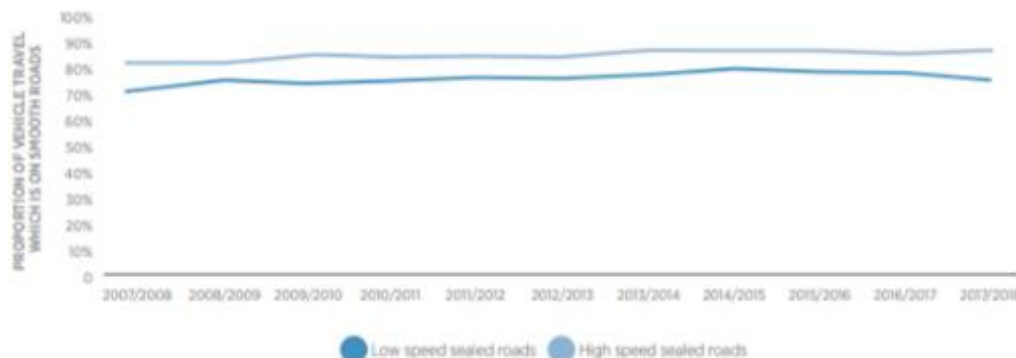
OUR GOAL: roads meet national standards for smoothness (are not uncomfortable/bumpy)

2018 result:

95% of all travel on high speed roads (70km/h or more), and **84%** of all travel on lower speed roads is on smooth surfaces.

This level of service has been almost constant since 2007.

FIGURE 1: PROPORTION OF TRAVEL WHICH IS ON SMOOTH ROADS

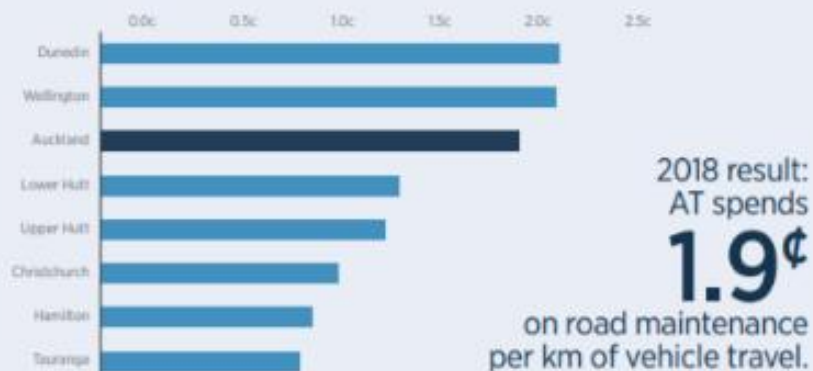


Auckland Transport - example

AFFORDABILITY

OUR GOAL: AT's costs for road maintenance and renewals, per km of vehicle travel, are reasonable when benchmarked against other NZ cities.

FIGURE 2: PAVEMENT AND SEAL COST (CENTS) PER KM OF VEHICLE TRAVEL



LIFECYCLE ASSET MANAGEMENT

OUR GOAL: to ensure efficient and effective lifecycle management of assets.

2018 result:
The conditions of
assets is assessed
through regular
inspections.

Each asset type
has an intervention
level based on a fit
for purpose level of
service.

The impact of this AMP on
asset condition is shown on
pages 20-23.



SUSTAINABILITY

OUR GOAL: to promote environmentally and economically sustainable practices.

Renewals projects that are adding value to wider AT and Government objectives include the replacement of streetlights with energy efficient LEDs, improvement of Franklin Rd, and many smaller safety and cycling improvements on existing roads.

Future sustainability initiatives include recycled construction materials, developing a climate change adaption plan, expanded use of stormwater treatment devices, and criticality and resilience assessment to not only promote strong environmental custodianship but also continue to support our social and cultural objectives.

THE RECONSTRUCTION OF FRANKLIN RD IS AN EXAMPLE OF A RENEWALS PROJECT THAT CONTRIBUTES TO WIDER SUSTAINABILITY GOALS



Auckland Transport - example

SAFETY

OUR GOAL: a safe network free of death and serious injury.

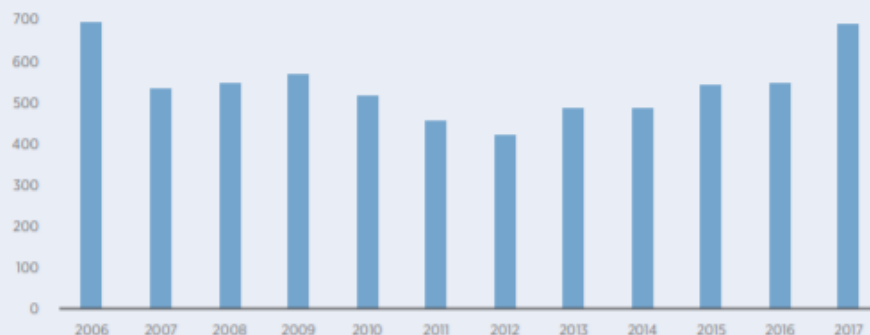
690

people were killed or seriously injured on Auckland local roads in 2017.



Road trauma is increasing faster than population growth or traffic growth.

FIGURE 3: DEATH AND SERIOUS INJURIES ON AUCKLAND LOCAL ROADS



TRAVEL TIME RELIABILITY

OUR GOAL: consistent and reliable travel times.

In the 12 months to July 2018,

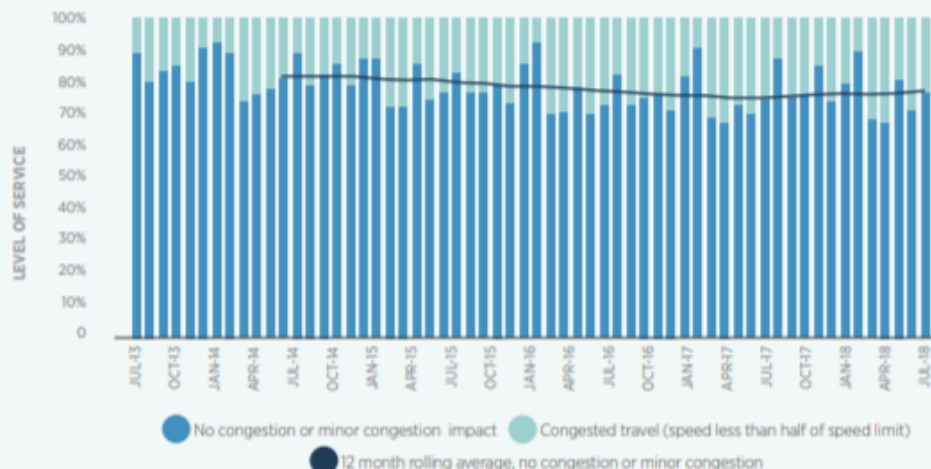


24%

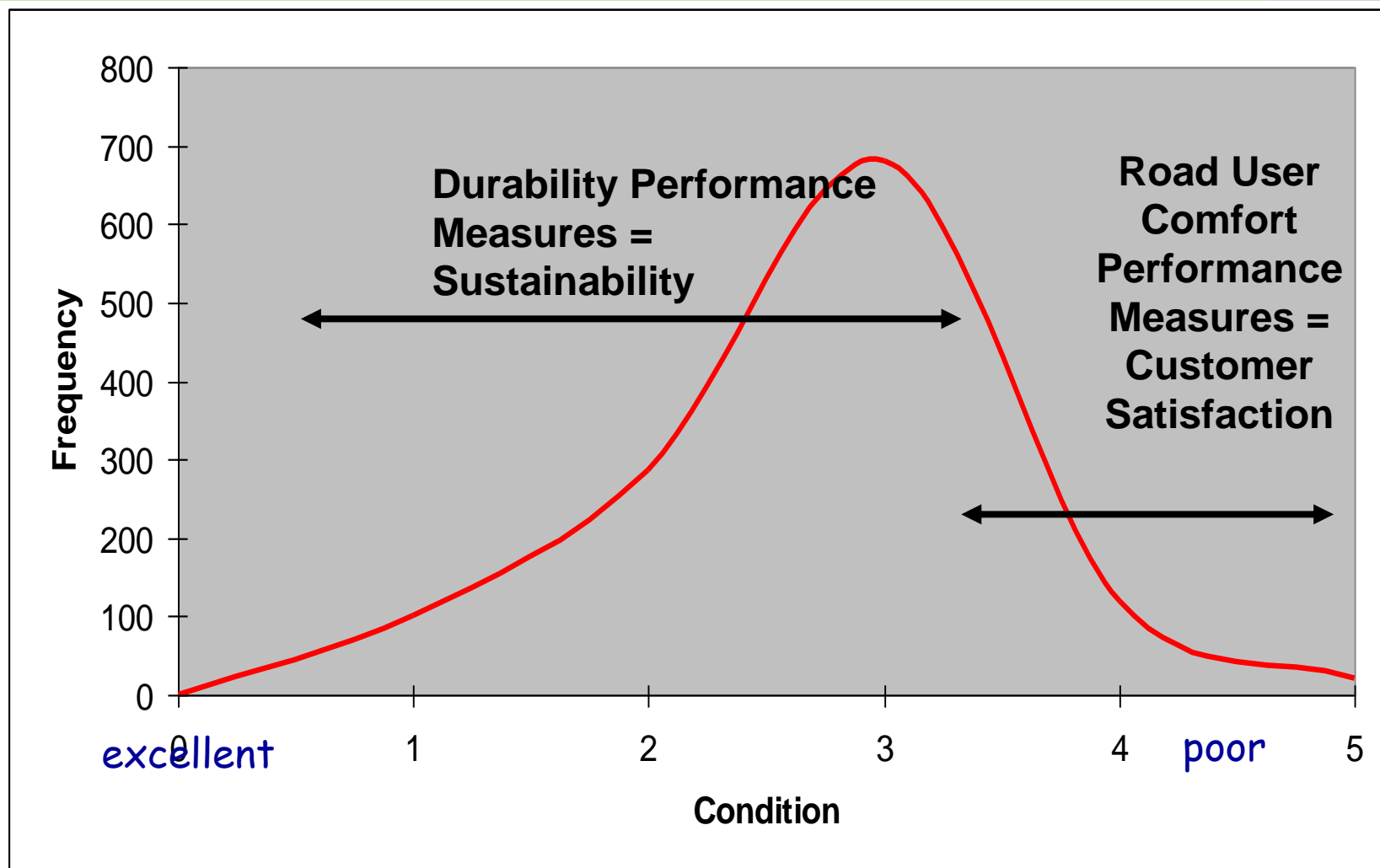
of the regional and arterial road network was congested during the morning peak.

(average speed less than half of the speed limit)

FIGURE 4: MORNING PEAK ARTERIAL ROAD LEVELS OF SERVICE TO JULY 2018



Average versus Peak Indicators



Summary

- Create clear customer focussed levels of service
- Create SMART performance measures that align to those levels of service
- Clear and consistent reporting

Questions?