Local Government Network Risk Assessment Frameworks

Final project report: 5 November 2024

AUSTRALASIAN COLLEGE OF ROAD SAFETY

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Executive summary

Local governments in Australia manage about 80 percent of the Australian road network by length, accommodating about 36 percent of all vehicle travel (Austroads, 2010; Institute of Public Works Engineering Australasia, 2024). Over half of all casualty crashes occur on local roads, including an estimated 40 percent of fatal crashes (Austroads, 2010).

Local roads are very different to state roads. Local roads typically have lower traffic volumes, more dispersed crashes and encompass a wide range of road environments. In recent years modified risk assessment methods such as Infrastructure Risk Rating (IRR) have simplified the risk assessment process – making them more accessible and applicable to local road environments. Even simpler methods have emerged, such as LG Stars in Western Australia.

For local governments with limited capability, understanding the range of risk assessment methodologies available is a challenge. Each methodology has strengths and weaknesses, and there is a lack of understanding about which methods are appropriate for different road environments, and for local government with different road safety capabilities.

This report clarifies what a 'fit-for-purpose' network risk assessment looks like for local governments and provides a framework for determining what type of risk assessment methodologies are appropriate for different types of local road environments, considering the capability and capacity of local councils to deliver these assessments.

Purpose and objectives

This project was undertaken to support the delivery of the *National Road Safety Action Plan 2023-25*, specifically the action for Australian Government to:

> *Lead the development of a framework in consultation with all governments, to support local governments to conduct fit-for-purpose network road safety risk assessments to prioritise infrastructure investment.*

This project involved conducting research and working closely with local governments, state and territory governments, and local government associations, to address the following objectives:

1. Identify and review the different road safety assessment methodologies currently used in Australia by state/territory and local governments to provide a baseline from which to measure progress against the National Road Safety Strategy 2021-30 and its Action Plan.
2. Recommend a methodology-neutral definition of 'fit-for-purpose' road safety risk assessment to be used by local governments which considers both state/territory and local government requirements.
3. Identify the skills, capabilities and support local governments require to develop 'fit-for-purpose' risk assessments.
4. Provide options for different frameworks which the Australian Government, state/territory governments and/or local government associations can use to support local governments develop risk assessments, as well as broader road safety capability building.

Objective 1: Road safety assessment methodologies currently used in Australia

The road safety assessment methodologies used in Australia were identified and reviewed, focusing on methodologies that are currently used for network-wide risk assessments. The review of risk assessment methodologies also:

- identified existing best practice in risk assessment
- identified where people can find more information or resources for each methodology
- compared the operational requirements of each methodology, and their suitability for different road environments
- categorised risk assessment methodologies into three tiers, from 'basic' to 'advanced'
- described the relative merits of proactive and reactive risk assessments, and how the two approaches can be combined.

The extent to which these methods are currently being used was examined in a survey of Australian local governments.

Objective 2: A methodology-neutral definition of 'fit-for-purpose' road safety risk assessment for local government

A definition of 'fit-for-purpose' road safety risk assessment for local governments was developed considering feedback received in the local government survey and from stakeholder interviews. Because of the wide range of local governments and local road networks across Australia, there is no single risk assessment methodology that is suitable for all types of roads, across all local governments. Therefore a concise definition of a "fit-for-purpose road safety risk assessment for local government" was developed where:

a) the depth of assessment matches the scale of risk on the road network (potential for fatal and serious injury), and hence the scale of potential infrastructure investment,
b) the assessment is appropriate for the type of roads that make up the local road network, and the predominant systemic risks on those roads, and
c) the requirements for the assessment are within the capability and capacity of the local government to deliver the assessment.

An important consideration in defining 'fit-for-purpose' is ensuring the risk assessment methodology is a good 'fit' for the type of roads and systemic trauma risks on a particular local road network. For example, a methodology that was developed for assessing risk on high-speed rural roads would have a poor 'fit' for assessing risk on road networks that is predominantly urban.

When considering the range of local road networks across Australia, it was also observed there are no 'fit-for-purpose' risk assessment methods that were specifically developed to assess intersection risk or vulnerable road user risk, at a network level. Two alternative approaches to assessing these types of risks for local road networks are suggested.

Finally, the report includes a simplified, step-by-step process for determining which risk assessment method (or methods) should be used for a particular local government network, considering the 'fit-for-purpose' definition above.

Objective 3: Skills, capabilities and support local governments require to develop 'fit-for-purpose' risk assessments

The skills, capabilities and support local governments require to develop 'fit-for-purpose' risk assessment were identified from the local government survey and through stakeholder interviews. The key feedback from local government practitioners was the need for funding or assistance with costs (of doing assessments), and resourcing (more staff, or access to skilled and trained staff).

In the interviews every local government interviewee commented on the lack of time and having other priorities as factors that make undertaking risk assessments difficult. The skills and knowledge held by local governments is also highly affected by turnover in staff.

A review of existing capability and support programs targeting local government across Australia was also undertaken.

Objective 4: Options for frameworks to support local governments develop risk assessments

Three options for frameworks that the Australian Government, state/territory governments and/or local government associations can apply to support local governments develop risk assessments were identified:

1. **Local government-led**: where an umbrella organisation(s) provide support such as funding, training, and other guidance, but it is ultimately up to the local government to lead the assessments.
2. **State/territory-led**: where the state or territory coordinates or undertakes assessments on behalf of local governments.
3. **A co-design approach**: where an umbrella organisation and local governments work together to deliver risk assessments and develop infrastructure programs/projects.

Each framework has pros and cons, and these are explored. Note that the approaches developed or currently provided by umbrella organisations could involve a mix of frameworks, and the line between each option is not clear-cut.

Options for prioritising support and resources for local government are also identified.

Recommendations

Several recommendations to further support local governments and to address gaps in risk assessment methodologies were identified in this report:

1. It is desirable that state and territory governments define which fit-for-purpose risk assessment methods should be used for local roads in their area. Ideally, the method(s) should align with the requirements of any funding program and consider the Movement and Place framework or functional classifications of local roads.
2. Further investigation into the suitability of the nationwide adoption of the LG Stars methodology is recommended, considering any learnings or limitations from recent applications in Western Australia.
3. Investment is needed to develop fit-for-purpose risk assessment methodologies for urban roads (focusing on VRU risk), and intersections in local government areas.

Abbreviations and acronyms

AADT	Annual average daily traffic
ACRS	Australasian College of Road Safety
ALGA	Australian Local Government Association
ANRAM	Australian National Risk Assessment Model
AusRAP	Australian Road Assessment Program
BCR	Benefit Cost Ratio
FSI	Fatal and serious injury
iRAP	International Road Assessment Programme
IRR	Infrastructure Risk Rating
LGA	Local government area (administrative area)
LiDAR	Light detection and ranging
NTRO	National Transport Research Organisation (formerly ARRB)
NRRIT	Network Roadside Risk Intervention Threshold
RAP	Road Assessment Program
RSIP	Road safety infrastructure program
SRS	Star Rating Score
TAC	Transport Accident Commission (Victoria)
VKT	Vehicle kilometres travelled
VRU	Vulnerable road user
WALGA	Western Australian Local Government Association

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1. Introduction

Local governments in Australia manage about 80 percent of the Australian road network by length, accommodating about 36 percent of all vehicle travel (Austroads, 2010; Institute of Public Works Engineering Australasia, 2024). Over half of all casualty crashes occur on local roads, including an estimated 40 percent of fatal crashes (Austroads, 2010).

The *National Road Safety Strategy 2021-30* recognises the key role of local governments in delivering safer roads across Australia. “Supporting local government” is a key focus area, with an enabling action to support local councils undertaking road safety risk assessments. This will give local councils the information they need to plan and prioritise future infrastructure investments[1].

Historically, methods for assessing road safety risk across road networks, such as AusRAP and the Australian National Risk Assessment Model (ANRAM) were developed for high-speed, rural state road networks. These methodologies produce high quality, fine-grained safety metrics that enable informed strategic investment in transformational road safety treatments.

Local roads are very different to state roads. Local roads typically have lower traffic volumes, more dispersed crashes and encompass a wide range of road environments. In recent years modified risk assessment methods such as Infrastructure Risk Rating (IRR) and the Austroads Stereotypes and Cross-sections methodologies have simplified the risk assessment process – making them more accessible and more applicable to local road environments. Even simpler methods are now emerging, such as LG Stars in Western Australia.

For local governments with limited road safety capability, understanding the range of risk assessment methodologies available is a challenge. Each approach has strengths and weaknesses, and there is a lack of understanding about which methods are appropriate for different road environments, and for local governments with different road safety capabilities.

This report seeks to clarify what a ‘fit-for-purpose’ network risk assessment looks like for local governments and provides a framework for determining what type of risk assessment methodologies are suitable for different types of local road environments and consider the capability and capacity of local councils to deliver these assessments.

1.1 Context: National Road Safety Strategy and Action Plan

The Australian Government has adopted a ‘Vision Zero’ target – a national target of zero road deaths and serious injuries by 2050. Achieving this target requires governments at all levels to plan and prioritise investment to improve road safety outcomes and manage network safety gaps across road assets.

The *National Road Safety Strategy 2021-30* sets out Australia’s road safety objectives over the next decade, including targets and key priorities for action. The primary target is to reduce the annual number of fatalities by at least 50 percent and serious injuries by at least 30 percent by 2030.

The *National Road Safety Action Plan 2023-25* supports the implementation of the Road Safety Strategy. Supporting local government is a key area of focus in the Action Plan, identifying the following specific actions for the Australian Government, and state and territory governments:

[1] Note that when referring to ‘infrastructure investment’ or ‘road safety infrastructure’, this includes speed management treatments such as speed limit reductions.

The Australian Government will:

Action	By when
Lead the development of a framework in consultation with all governments, to support local governments to conduct fit for purpose network road safety risk assessments to prioritise infrastructure investment	Late 2023
Co-ordinate the delivery of road safety training to local governments in consultation with state and territory governments	Late 2024

State and territory governments will:

Action	By when
Provide local governments with access to serious injury and fatality data for their networks	Commence late 2023
Support local governments to improve the data they hold on local road networks, to: • Better understand the safety of their network • Report on and invest in their local infrastructure • Communicate and engage with their communities on road safety	Ongoing

The Action includes several safety performance indicators to track progress in delivering the Strategy, including:

Safety performance indicators

- Increased share of state and territory governments and local councils with a fit-for-purpose road safety risk assessment as an investment plan for its infrastructure

1.2 Project purpose and objectives

This project supports the delivery of the *Road Safety Action Plan*, specifically the action on the Australian Government to:

> *Lead the development of a framework in consultation with all governments, to support local governments to conduct fit-for-purpose network road safety risk assessments to prioritise infrastructure investment.*

This project involved conducting research and working closely with local governments, state and territory governments, and local government associations, to:

1. Identify and review the different road safety assessment methodologies currently used in Australia by state/territory and local governments to provide a baseline from which to measure progress against the Road Safety Strategy 2021-30 and its Action Plan.
2. Recommend a methodology-neutral definition of ‘fit-for-purpose’ road safety risk assessment to be used by local governments which considers both state/territory and local government requirements.
3. Identify the skills, capabilities and support local governments require to develop ‘fit-for-purpose’ risk assessments.
4. Provide options for different frameworks which the Australian Government, state/territory governments and/or local government associations can use to support local governments develop risk assessments, as well as broader road safety capability building.

1.3 Project delivery

The Australasian College of Road Safety (ACRS) was engaged to deliver this project for the Department of Infrastructure, Transport, Regional Development, Communications, and the Arts. Ableyi Limited were contracted by ACRS to support them in the delivery of this project.

To fulfil the project objectives, the ACRS and Ableyi were required to deliver the following activities:

1. Conduct up to 40 one-on-one interviews with a range of local governments from all the jurisdictions incorporating a range of network sizes and composition, remoteness, and population; local government associations; and state/territory road transport officials to:
   a) identify the different road safety assessment methodologies currently being used in Australia by state/territory and local governments,
   b) recommend a methodology-neutral, practical definition of 'fit-for-purpose' road safety risk assessment that can be used by the variety of public road management authorities across Australia, from our major capital cities and metropolitan areas to the most remote and least resourced areas of Australia, and
   c) identify the skills, capabilities and support local governments require to develop 'fit-for-purpose' risk assessments.
2. Develop, manage, and analyse an online survey of all Australian local governments to determine whether they conduct 'fit-for-purpose' road safety risk assessments, and if so note:
   a) the percentage of their road network assessed in the previous financial year,
   b) the methodology(ies) they use to conduct road safety risk assessments,
   c) how the assessments inform road safety planning and investment, and
   d) what skills, capabilities and support they need to start to deliver fit-for-purpose road safety risk assessments and integrate these into decision making or increase the percent of their network assessed per annum.
3. Review existing programs which provide road safety capability building/support to local governments, in addition to the guidance readily available to assist local governments to conduct risk assessments.

1.4 Audience

The report is primarily prepared as a resource for state and territory governments to support local government conduct network risk assessments on local roads. The report can also be used by local government associations and local government directly to select and apply 'fit-for-purpose' risk assessment methodologies on local roads in the absence of direction or guidance from state or territory governments.

1.5 Report structure

This report represents the final deliverable for this project, and is structured to meet the project brief as follows:

- **Chapter 2** discusses the different network risk assessment approaches and methods currently in use or available in Australia. It includes a summary of best practice in network risk assessments and a review of each methodology. Guidance is provided on where to find supporting material and resources. Finally, a tier-based approach is described to classify different types of assessment methods.
- **Chapter 3** presents the findings from the local government survey.
- **Chapter 4** presents key themes from interviews with state and territory governments, local governments, and local government associations.
- **Chapter 5** discusses the range of factors that influence the definition of a 'fit-for-purpose' road safety risk assessment method, considering best practice in risk assessment, state and territory requirements, and the local road context.

- **Chapter 6** presents a step-by-step process for determining which methods are 'fit-for-purpose', for a given local government.
- **Chapter 7** identifies and reviews three options for frameworks for supporting local governments develop risk assessments. Examples are provided demonstrating how different approaches are currently being applied in Australia.
- **Chapter 8** presents the conclusions and recommendations from this project.

2. Risk assessment approaches and methods

A network risk assessment is undertaken across all or part of a road network. It involves:

- using information about the road environment or crash data to determine the current (or projected) safety risk to road users at corridors and/or intersections, and
- applying this methodology across the network to identify those sites at highest risk of a fatal or serious injury crash in the future.

"High risk" sites are defined either by their risk relative to other locations, or by comparing them to an established risk threshold like a Star Rating or a specified crash density/crash rate metric.

The objective of the network risk assessment approach is to ensure that locations with an established or emerging safety issue are prioritised for road safety infrastructure treatments ahead of lower risk locations.

2.1 Best practice in network risk assessment

Guidance for best practice network risk assessments (in the context of informing the delivery of road safety infrastructure) is provided in:

- Austroads *Guide to Road Safety Part 2: Safe Roads* (Austroads, 2024b)
- Austroads report: *Best Practice in Road Safety Infrastructure* (Austroads, 2018)

Both documents were reviewed to identify key recommendations for risk assessments, particularly for the local government context.

Austroads Guide to Road Safety Part 2: Safe Roads

The Austroads *Guide to Road Safety Part 2: Safe Roads* (Austroads, 2024b) includes a chapter on risk identification and analysis. A key step in the risk assessment process involves understanding the problem that needs to be solved. The guide recommends that *"… road controlling jurisdictions should conduct a macro-level analysis of high-severity crashes on their road network to understand the crash issues in their jurisdiction, using the key crash types*." The term 'key crash types' refers to broad categories of road safety risks, which can be generalised as:

- high-speed lane departures
- intersections
- vulnerable road users (VRU)

Analysis indicates that over 80 percent of high-severity road trauma events can be categorised into one of these three key crash types[2] (Austroads, 2024b). For that reason, risk assessment methods and the planning of delivery of road safety infrastructure should target these systemic road trauma risk areas.

The Guide also describes three different approaches to network analysis, for identifying and prioritising road safety infrastructure:

- Reactive approaches – identifying high-risk sites based on crash analysis, e.g., the 'blackspot' approach. Sites that exceed a minimum threshold in absolute numbers of fatal or serious injury crashes, or crash rate per kilometre or per site (for intersections) are prioritised for treatment.
- Proactive approaches – identifying and treating of high-risk locations before crashes occur, using risk assessment tools (methodologies) that do not rely on crash data.
- Systemic approaches – defining the desired future 'safe' state of a road network, then working backwards to identify what measures (e.g., infrastructure) are required to achieve this desirable

[2] Note that this figure is not specific for local roads. The last systematic analysis of local road trauma in Australia was published by Austroads in 2010 (research report. AP-R359/10). This research found that the leading crash types for fatal crashes on local roads in Australia are off path on curve; off path on straight; pedestrian and opposing directions.

future state. This is sometimes referred to as Vision Zero modelling, or 'back-casting'. There are five key steps to this process:

a) define the future 'Safe System' state of the network
b) evaluate the current state of the network
c) measure the gap between the future state and current state
d) identify possible solutions (e.g. infrastructure) to bridge the gap
e) prioritise solutions and interventions

The Guide describes each approach in detail, including opportunities and limitations. Key points that are potentially relevant to local government roads include:

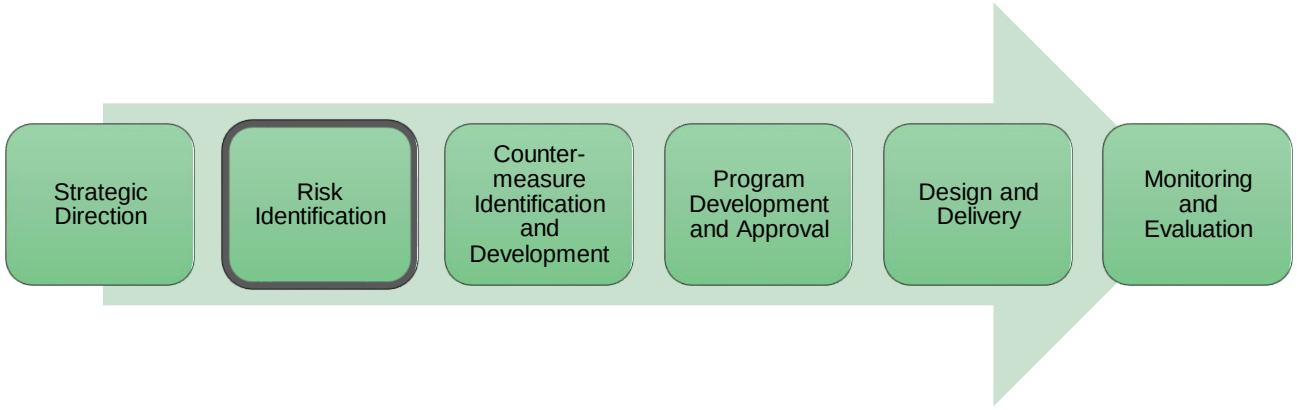
- That reactive approaches are useful where there is sufficient crash history. However, crashes tend to be dispersed on lower volume roads, making it harder to identify high-risk sites using reactive methods. This is especially true in rural and remote areas where single-vehicle, high-speed lane departure crashes are widely distributed across the road network.
- Reactive and proactive approaches are often used in combination. For example, on a rural network with many run-off-road crashes, it is desirable that all potential high-severity locations be treated, regardless of whether crashes have occurred. A proactive risk rating approach can be used to identify and prioritise equally risky locations based on factors that contribute to run-off-road crashes, such as alignment, lane and shoulder width, and roadside features, independent of crash history.
- Risk ratings derived from proactive approaches, such as AusRAP, ANRAM and IRR, are highly correlated with exposure-adjusted risk metrics, such as Personal Risk.
- Some local governments do not have the capacity or capability to apply the proactive approach at a network-wide level. State or federal government organisations can use efficiencies of scale to assist local government with understanding risk across their road networks.
- Vision Zero modelling (the systemic approach) is the foundation of network safety planning. Infrastructure programs that are focused on transforming the network to the desired Safe System future state are strongly supported. The way in which these programs are developed can be done using reactive or proactive methods. Both methods have merit, although over time moving to a proactive risk-based approach is preferred.

Austroads: Best Practice in Road Safety Infrastructure Programs

The Austroads report *Best Practice in Road Safety Infrastructure Programs* (Austroads, 2018) describes best practice principles for the development and delivery of road safety infrastructure programs, focusing on how road safety infrastructure programs (RSIPs) can be improved to maximise fatal and serious injury (FSI) savings.

The report is structured around the RSIP development and delivery process (Figure 2.1). The 'Risk Identification' stage occurs early in the development of RSIPs - after the strategic direction is set (for example, through a road safety strategy or action plan), but before countermeasures (e.g. infrastructure treatments) are identified.

Figure 2.1: Road Safety Infrastructure Program: development and delivery process (Austroads, 2018)



The guidance for each stage in RSIP development is presented as best practice principles (Table 2.1). These were informed from a literature review and developed in consultation with state, territory and federal governments.

Table 2.1: Best practice principles for risk assessment (Austroads, 2018)

Best practice principles for risk assessment	
1	Risk analysis needs to be completed at a network level, including local roads, for the purposes of prioritising investigation and investment decisions.
2	Risk analysis methods that use a combination of crash history and proactive estimates of risk informed by road, roadside and adjacent land use features are the best approach for predicting future high-risk locations.
3	Risk analysis methods based on crash history need to be modified to an equivalent risk value[3] so that risk is not inferred on the basis of high-severity outcomes or unadjusted clusters of crashes alone.
4	Risk analysis methods set by the funder should demonstrate how/why the selected methods will achieve the ambitious targets and aspirational outcomes of the highest-level strategic road safety documents.
5	Risk needs to be understood from both a 'Collective' and 'Personal' perspective.

The guidance goes on to state that that Collective Risk (a density measure of risk) is highly correlated with traffic volume. As a result, smaller jurisdictions with lower traffic volumes tend to find it difficult to compete for funding from programs that require evidence of a minimum number of injury crashes over a specified time-period. Interestingly, few jurisdictions take exposure into account in their risk metrics, even though it is the exposure-based risk metrics (such as Personal Risk) that are highly correlated with Star Ratings and IRR. Personal Risk provides the basis for appreciating the scale of potential reduction in deaths and serious injuries whereas Collective Risk represents the scale of the existing problem.

A key learning from this report is that risk identification (risk assessment) is just one part of a larger process of planning, developing, and delivering road safety infrastructure. Risk assessment is not a standalone activity. It should be informed by the strategic direction (for example road safety strategies, action plans, and funding programs), and lead to effective treatment selection, programming, and delivery.

[3] This involves transforming injury crashes into FSI equivalents which represent the potential for that crash type to result in fatal or serious injury in the future. The development and use of FSI equivalents is explained in more detail in Section 2.1.

Crash metrics and the use of FSI equivalents in reactive risk assessments

Collective and Personal Risk explained

Collective Risk is a measure of crash or injury density. In network risk assessments, it is typically expressed as:

- FSI per year for intersections
- FSI per year per kilometre for corridors.

In general, roads with higher volumes of road users have more crashes, because more road users are exposed to a potential crash risk. Therefore, Collective Risk tends to be highest on:

- roads carrying high volumes of traffic, for example arterial corridors
- road networks with high volumes of vulnerable road users (e.g. pedestrians, cyclists and micromobility users), for example metropolitan road networks.

Personal Risk is a measure of crash or injury rate. It can be calculated by taking the total FSI (collective risk) and normalising this by the volume of road users (traffic volume). In corridor risk assessments, it is commonly expressed as FSI per 100 million vehicle kilometres travelled (VKT).

Proactive risk assessment methods, like IRR and AusRAP, also generate personal risk metrics. This is because they evaluate the underlying risk of a road for individual road users.

Note: Personal Risk is not currently used to assess intersection risk in Australia, primarily due to the lack of intersection traffic volume data. In New Zealand, Personal Risk for intersections is calculated using the daily product of flow - the product of the conflicting flows entering from the major and minor approaches to the intersection (NZ Transport Agency, 2013).

Developing and using FSI equivalents to enhance crash-based risk assessments

FSI equivalents are severity indices that are used to estimate the number of fatal and serious injuries that are likely to occur in the future, based on the number and type of injury crashes that have occurred in the past.

Applying FSI equivalents in crash-based network risk assessments provides a better assessment of the level of risk than using fatal and serious crash data alone. This is because:

- The FSI equivalent approach draws from a larger crash dataset of all injury crashes (fatal, serious and minor injury), therefore the assessment is statistically more robust than relying on fatal and serious injury crashes alone.
- The ‘randomness’ of the severity of injuries from a given crash is replaced with an average severity score for that crash, considering the road user(s) involved, the road environment, and the crash movement.

FSI severity indices (or equivalents) represent the average number of people killed and seriously injured for every reported injury crash. Severity indices are usually calculated for different crash types considering:

- the speed environment (urban or rural)
- crash location (intersection or midblock)
- intersection control (e.g., priority, traffic signals, roundabout) – for intersection crashes only
- road user type (vehicle only, motorcyclist, bicyclist, pedestrian)
- crash movement type.

Speed scaling factors can also be used to modify FSI equivalents, considering the underlying speed limit.

Developing FSI equivalents

Every state/territory captures and reports serious injury data from crashes differently (if at all). Therefore, it is not currently possible to develop a national set of FSI equivalents. Each state/territory should develop their own FSI equivalents for use with crash data collected and reported in their state/territory.

More information and examples

More information on FSI equivalents is provided in Section 8 (Estimating Benefits of Infrastructure Treatments) of the Austroads Guide to Road Safety Part 2: Safe Roads: https://austroads.com.au/publications/road-safety/agrs02

An example of how FSI equivalents were developed and are used in New Zealand is available at: www.nzta.govt.nz/safety/partners/speed-and-infrastructure/speed-and-infrastructure-documents/calculating-dsi-equivalents/

Note that the terminology used in New Zealand is 'DSI' (death and serious injury), not FSI.

Summary of best practice in road safety network risk assessment

Considering best practice, network risk assessment methods should desirably:

- align with the systemic road trauma risks on the road network
- help local governments identify and prioritise where to invest in road safety infrastructure
- include a combination of reactive and proactive risk assessment methodologies
- prioritise proactive risk assessment methodologies for road networks where crashes are more dispersed
- use modified or equivalent crash risk values (where crash-based methodologies are used)
- align with targets or outcomes set in road safety strategies and action plans
- consider risk from both a collective (total risk) and personal risk perspective.

Additionally, where local governments do not have the capacity or capability to apply a proactive approach at a network-wide level, state/territory or federal governments should consider using efficiencies of scale to assist local government with this task.

These points were considered in the development of the 'fit-for-purpose' definition of risk assessment for local government (refer Section 5 of this report).

2.2 Risk assessment methods currently used in Australia

This section provides an overview of current risk assessment methods in use in Australia, specifically:

1. Crash-based methods
2. RAP methods: International Road Assessment Programme (iRAP), the Australian Road Assessment Programme (AusRAP), and AiRAP
3. Australian National Risk Assessment Model (ANRAM)
4. Austroads: Stereotypes for Cross-sections and Intersections (Austroads Stereotypes)
5. Infrastructure Risk Rating (IRR)
6. LG Stars – Safety Ratings Tool (LG Stars)

The overview for each method includes a description of the methodology, the resources and training required to apply the methodology (inputs and expertise), and a commentary on how the methodology is currently being used across all levels of government in Australia.

Information on each risk assessment approach was obtained from primary sources where possible, including technical guides, research reports and conference papers. Relevant insights from interviews (refer to Section 4) were included where relevant. The project team also have extensive personal experience with some methodologies which has informed the review.

Recognition is given to the following documents which include extensive reviews of different risk assessment approaches. This material has been repurposed and acknowledged where relevant:

- Austroads (2022b). *Updates to Online Road Safety Applications* (Internal Report for Austroads Project SAG6323). This project was undertaken by Ableyi for Austroads in 2022. The deliverable included a stocktake of online road safety tools and applications that were available to practitioners, or methodologies that could potentially be developed into online applications. Risk assessment methodologies reviewed in this project included IRR, ANRAM, iRAP, and Austroads Stereotypes.
- Western Australian Local Government Association (WALGA) (2023), *Road Safety Ratings Project, Reference Document*. This document has a literature review that includes an evaluation of existing road safety assessment tools for roads. This review helped provide background for the development of WALGA's LG Stars Safety Rating Tool. Relevant methodologies that were evaluated were iRAP, AusRAP, ANRAM, IRR, and the Austroads Stereotypes.

Crash-based methods

Description

This approach involves using historic crash data to assess the safety risk of roads and intersections. This is described as a reactive approach because it requires crashes to occur before high-risk locations can be identified. Locations with a high rate of injuries or crashes are often referred to as 'blackspots' or 'black links'.

Crash-based risk assessments are relatively easy to conduct provided there is sufficient and accurate reporting of crashes, particularly crash location and injury severity.

There are several variations in how crash data can be mapped and analysed to identify high-risk sites, for example:

- Calculating casualty crash counts and rates (e.g., total crashes/km, or crashes per 100 million vehicle kilometres travelled (100M VKT).
- Calculating actual fatal and serious injury (FSI[4]) counts and rates (e.g., FSI/km, or FSI/100M VKT).
- Calculating risk metrics using modified FSI equivalents (where each injury crash is adjusted to reflect the likelihood of similar crashes resulting in fatal or serious injury).
- Undertaking separate corridor (mid-block) and intersection assessments.
- Undertaking mode-specific assessments, for example assessing high-risk motorcycle routes.

This approach is very useful where there are high concentrations of crashes (Austroads, 2021). However, several weaknesses have been identified, including:

- Crash density metrics strongly correlate with traffic volumes.
- Crash history can be a poor indicator of underlying risk, especially in lower volume areas.
- Under-reporting of crashes, which is often highest among the vulnerable road users, e.g., pedestrians and cyclists.
- Most crashes in Australia are estimated to occur outside what would traditionally be classified as 'blackspots'.
- The reactive approach is not aligned with the ethical philosophy of the Safe System approach (Austroads, 2020a; Austroads, 2021).

Crash-based metrics are sometimes mapped and provided to local government by the state/territory government in a web map or a factsheet format. Examples include the Main Roads WA Crash Map, Victoria Local Roads Dashboard, and the New South Wales Safe System Analytics Council app.

Resources/other requirements

The basic requirements for a crash-based network risk assessment are:

- A road network, ideally with traffic volumes, speed limits and a road hierarchy or classification.
- Crash data (with location), ideally with injury count and severity, movement type, and road user involvement.

Basic approaches require little road safety knowledge or expertise, for example reviewing crash data on a map to identify locations with many crashes. Desirably, each crash should be modified to an equivalent risk value so that risk is not inferred based on high-severity outcomes or unadjusted clusters of crashes alone (Austroads, 2018).

Commentary on current use and application

Road safety funding models in Australia have traditionally relied on crash-based or 'reactive' approaches for identifying where road safety problems should be addressed. It is not surprising, therefore, that crash-based methods are widely used across Australia, at all levels of government.

Resources and guidance

More information on approaches to crash-based risk assessments is provided in the Austroads *Guide to Road Safety Part 2: Safe Roads* (Austroads, 2024b).

A commentary on modifying crash data using FSI equivalents is provided in Section 2.1

[4] Depending on the jurisdiction, this may be referred to as *killed and seriously injured* (KSI) or *deaths and serious injuries* (DSI).

RAP methods (iRAP, AusRAP, and AiRAP)

Description

The iRAP is a registered charity that works in partnership with governments, road authorities, mobility clubs, development banks, non-government organisations, and research organisations to help work towards a world free of high-risk roads.

Road Assessment Programs (RAPs) are active in over 100 countries globally, and iRAP is an umbrella organisation for many RAPs around the world, including EuroRAP, AusRAP, usRAP, and KiwiRAP. iRAP has developed several protocols and tools to assess and improve the safety of roads (iRAP, 2024), including:

- Crash Risk Mapping – using detailed crash data to produce maps showing the risk arising from the interaction of road users, vehicles, and the road environment.
- Star Ratings – providing an objective measure of the level of safety 'built-in' to the road for vehicle occupants, motorcyclists, bicyclists, and pedestrians.
- Fatality and Serious Injury Estimations – providing estimates of FSIs along each segment of an existing road or design and supports the prioritisation of investment.
- Safer Road Investment Plans – drawing on data underpinning Star Ratings and FSI estimates to determine the most cost-effective road safety upgrades.
- Performance Tracking – using Star Rating and Crash Risk Mapping to measure change in safety performance over time.

iRAP provides enabling software to support countries undertaking RAPs, including ViDA – a free online data processing engine for Star Ratings, FSI Estimates, and Investment Plans.

To determine a road's Star Rating, road assessment data must be collected and uploaded in ViDA. This assessment involves an accredited supplier driving over the road with a specially equipped survey vehicle. Trained and accredited analysts then view and code road and roadside features in 100m segments to determine a Star Rating Score (SRS), from which the Star Rating is calculated. There is also a Star Rating Demonstrator tool within ViDA that allows users to manually enter coded data for a specific road cross-section to determine the Star Rating at that site.

The AusRAP Star Rating protocol was developed from the umbrella iRAP protocol. It was originally introduced into Australia by state mobility clubs, but the program is now being led by Austroads.

The AiRAP approach to Star Rating was first piloted in New South Wales, Australia. This approach uses artificial intelligence and existing datasets to code RAP data, negating the need for drive-overs (iMOVE Australia, 2022). This approach has since been adopted by Main Roads WA, who are now Star Rating over 19,000 km of state roads.

The NTRO has developed the NetRisk2 platform which can input AusRAP data and combine it with ANRAM. This platform allows users to view the RAP data on a map, to test the effectiveness of different treatment options, and to develop a program of works.

Resources/other requirements

To determine a road's Star Rating, road assessment data must be collected and uploaded in ViDA. In Australia, this assessment involves either:

- An accredited supplier doing a drive-over with a specially equipped survey vehicle. Trained and accredited analysts then view and code road and roadside features in 100m segments to determine a Star Rating Score (SRS), from which the Star Rating is calculated.
- For the AiRAP approach, some (or all) of the road features are coded from other data sources, such as LiDAR.

State/territory, and local governments undertaking RAP assessments in Australia rely on consultants to collect, code and/or process road survey or video data. This is predominantly NTRO for AusRAP, and Anditi for AiRAP (Anditi being the only AiRAP accredited provider in Australia).

Other consultants and users of RAP data can also seek out iRAP training and certification, but there is a cost to this.

Commentary on current use and application

AusRAP assessments have been undertaken for more than 100,000 km of Australia's road network (Austroads, 2024a). All Australian states and territories are currently undertaking (or have undertaken) AusRAP assessments. Updated AusRAP Star Ratings will be published in 2024, with a commitment to publish Star Ratings for all major arterial roads by 2025.

For local government, in their review of iRAP tools and software, WALGA found that the iRAP protocol is "*unlikely to be within the capacity or capability of many local governments in Western Australia, who may have limited funding, extensive networks, lack of equipment and limited staff to complete the accreditation process or carry out data collection and analysis"* (WALGA, 2023).

Some local governments in Australia have had AusRAP assessments undertaken, although usually this has been done for a subset of higher volume or arterial roads. These assessments are predominately being undertaken by NTRO and integrated with ANRAM through the NetRisk2 platform. During the interviews, some local governments mentioned that survey data collected for asset management purposes is also used for AusRAP coding.

In Austroads (2022b) a survey of Australian and New Zealand road safety practitioners found that many respondents had used ViDA for risk assessments and to report AusRAP Star Ratings. The iRAP Star Rating Demonstrator (in ViDA) has been used to support program funding applications to demonstrate that projects could meet a '3-star or better' criterion for funding. While users generally found the ViDA Star Rating Demonstrator easy to use, they noted that training was difficult to access and supporting guidance hard to find.

There may be potential to expand the AiRAP methodology currently being used in Western Australia to other local road networks, although it is still a relatively new methodology compared to traditional AusRAP data collection methods.

One of the benefits in the Star Rating methodology is that the outputs are easy to communicate to politicians, elected members, and the public. The Star Rating scale is easy to understand (1-star is very 'bad' and 5-star is very good).

Resources and guidance

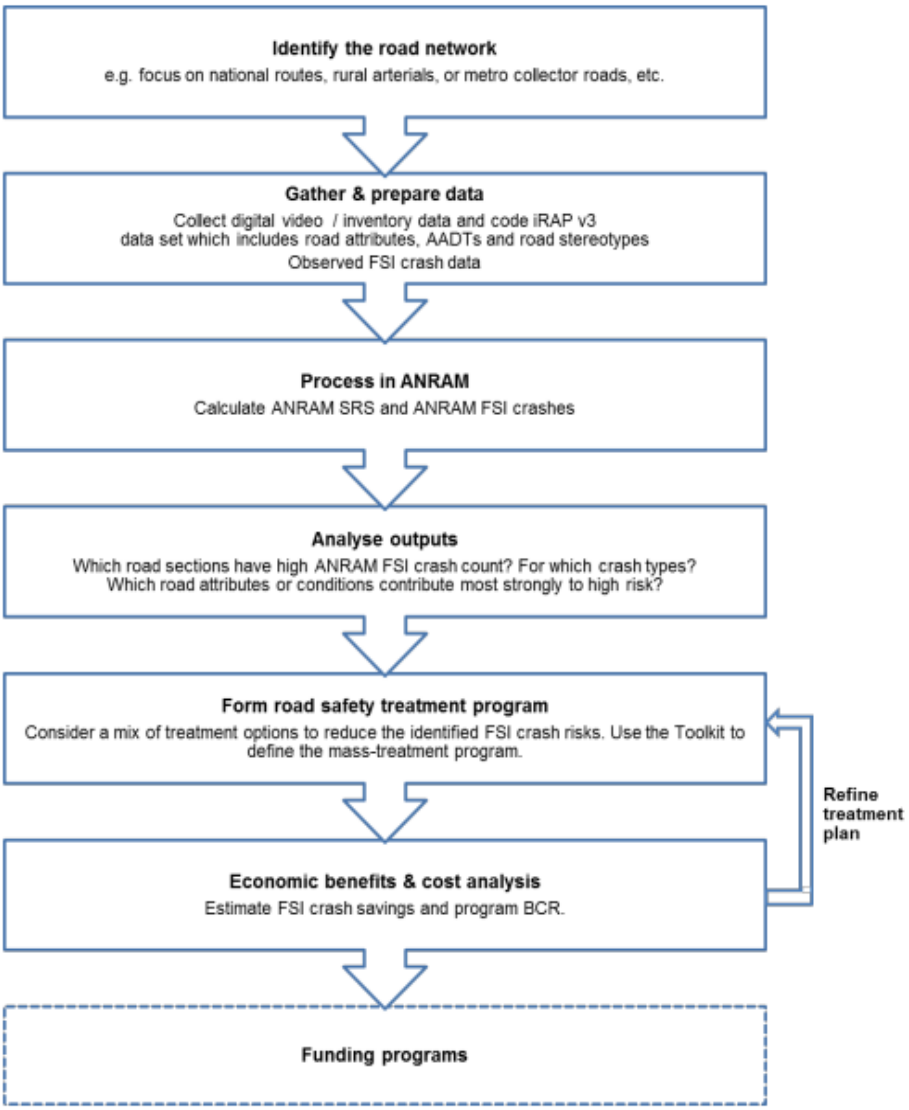
More information on RAP methods is provided on the following websites:

- *About AusRAP:* https://austroads.com.au/safety-and-design/road-safety/ausrap
- *iRAP Tools:* https://irap.org/rap-tools
- *iRAP ViDA software:* https://vida.irap.org/
- *Netrisk2*: www.arrb.com.au/netrisk2

Australian National Risk Assessment Model (ANRAM)

Description

ANRAM uses a combination of iRAP risk assessment algorithms, crash prediction models and FSI crash history to identify sections of road that have a predicted high risk of future FSI crashes. The estimated risk is derived through the relative safety performance of existing road infrastructure, vehicle speeds, traffic flow, and the potential for vehicle conflicts. It also allows the modelling of road improvements and the estimation of FSI crash savings (Austroads, 2014). Benefits of potential treatment programs can then be calculated:



(Image source: Austroads, 2014)

ANRAM was originally developed in 2014 and enabled through a macro-enabled Excel workbook. ANRAM is now built into NTRO's Netrisk2 application, which was released in mid-2022 (NTRO, 2024).

At the time it was developed, ANRAM was described as ideal for local government use, as it addresses crashes which are dispersed across a road route, which is more common in regional and remote areas where traffic volumes are generally lower (Austroads, 2014; WALGA, 2023). This provides local governments with the ability to assign a crash risk rating to a road route which may have no crash history.

Resources/other requirements

ANRAM requires a RAP coded dataset and observed FSI crash data. ANRAM is not a standalone methodology, as it requires iRAP rating data to be captured to populate the ANRAM risk analysis module, leading some users to choose to use iRAP's free ViDA tool instead (Austroads, 2020c). Since mid-2022, ANRAM has been made available as part of the NetRisk2 application, which governments can purchase from NTRO.

WALGA (2023) note that ANRAM road data coding is associated with a significant effort and cost, depending on which of the following approaches is taken:

- in-house resourcing, which would require data coding staff to be trained
- hiring an external experienced service provider
- collaborating with established AusRAP partners and sharing the costs.

Commentary on current use and application

Because of the more complex inputs required, ANRAM has traditionally been adopted for use by state/territory governments and rarely used among local governments (Austroads, 2020c).

WALGA (2023) comment that although the ANRAM protocol is comprehensive and in line with the Safe System approach to road safety, it is likely to be well beyond the capacity and capability of many local governments (in WA), particularly regional offices which have limited access to funding, expertise, and equipment.

It is noted that few local governments currently have RAP data. Those that do have this data generally also have access to NetRisk2 and can access ANRAM through this platform.

Resources and guidance

For more information, refer to:

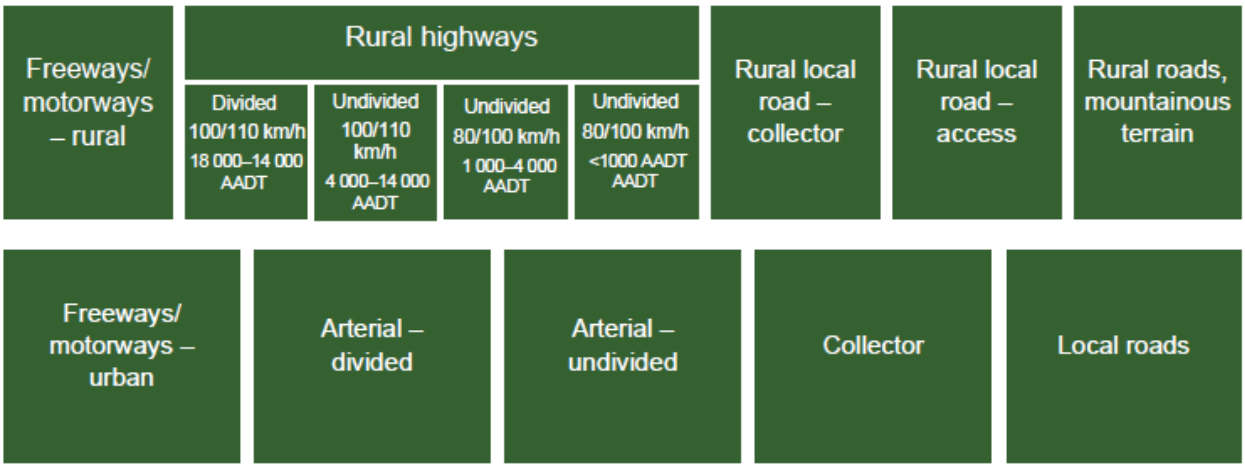
- *Australian National Risk Assessment Model,* Austroads report AP-R451-14 (Austroads, 2014)
- *Netrisk2*: www.arrb.com.au/netrisk2

Austroads Stereotypes for Cross-sections and Intersections

Description

Cross-section designs for 13 road stereotypes were developed for Austroads to enable road managers, planners, and designers to achieve improved safety outcomes, with the application of consistent standards, as far as practicable, along a road corridor (Austroads, 2020b).

An overview of the 13 stereotypes (source: Austroads, 2020b):



Several cross-sections are provided for each stereotype. The crash risk for each cross-section was assessed using iRAP star ratings and ANRAM FSI crash prediction models. Tables for each stereotype display the expected safety performance of each cross-section (indicative Star Rating and crash FSI crash rate). Tables for intersection stereotypes are also provided.

Example of a road stereotype table with Star Rating and crash metrics (Austroads, 2020b):

ROAD DESCRIPTION: rural local access road, sealed and unsealed, single carriageway, two-lane two-way, AADT < 1 000																
ID	Star rating (Global iRAP) (Stars) Curvature: straight - sharp		Predicted FSI crashes/100 million vkt (ANRAM) Curvature: straight - sharp		Formation width (m)	Seal width (m)	Equiv sealed lane width (m)	Shoulder width (left) (m)	Sealed shoulder width (left) (m)	Runout distance (roadside) (m)	Verge (batter) slope (1:x)	Safety barrier - roadside	Centre barrier	Wide centreline width (m)	Audio-tactile edge line marking (Y/N)	Audio-tactile centeline marking (Y/N)
	100 km/h	80 km/h	100 km/h	80 km/h												
1	5.2-5.1	5.6-5.5	0.02	0.010-0.011	15.0	15.0	3.5	2.5	2.5	-	-	Flexible	Flexible	3.0	Y	Y
2	4.5-4.3	5.2-5.1	0.90-1.02	0.46-0.52	10.0-12.0	12.4	3.5	1.0-2.0	1.0-2.0	4.0	4	Flexible	-	1.0	N	N
3	3.5-3.4	4.2-4.00	4.55-5.25	2.34-2.69	8.6-10.6	10.5	3.3	1.0-2.0	1.0-2.0	4.0	4	-	-	-	N	N
4	3.4-3.2	4.1-3.9	5.40-6.20	2.75-3.18	6.6-9.0	9.0	3.3-3.5	≤1.0	≤1.0	4.0	4	-	-	-	N	N
5	2.8-2.6	3.6-3.5	9.80-11.40	5.05-5.84	6.6-7.0	7.0	3.3-3.5	0.0	0.0	3.0	3	-	-	-	N	N
6	2.6-2.3	3.5-3.3	8.88-10.26	4.56-5.27	7.0	7.2	3.0	0.5	0.5	3.0	4	-	-	-	N	N
7 (unsealed)	0.7-0.6	1.6-1.5	27.71-28.83	14.23-14.80	6.0	0.0	0.0	0.0	0.0	3.0	3	Flexible (targeted)	-	-	N	N
8 (unsealed)	0.1-0	1.0-0.8	48.44-56.03	24.87-28.77	6.0	0.0	0.0	0.0	0.0	3.0	3	-	-	-	N	N

This methodology was developed to help users develop safety improvement plans, for example a network safety plan on a corridor or road network.

Resources/other requirements

A User Guide sets out how to assess roads, identify potential treatments, and develop an infrastructure program using the stereotypes and cross-sections (Austroads, 2020b). Case studies and worked examples are also provided.

To assess the relative risk of a road corridor, users must collect specific information about that corridor. For rural roads, this includes curvature, annual average daily traffic (AADT), speed limit, length, formation width, lane width, sealed shoulder width, roadside runout distance, verge slopes, and the presence (or absence) of barriers and audio-tactile line marking. With this information, users look up a series of tables to determine which cross-section and stereotype is the best fit for their road corridor.

WALGA (2023) noted that limited training in this approach is available to local government end users. It was also noted that although video-based surveys are not specifically required for this methodology – street view imagery (e.g., from Google Maps) or a drive-through is still necessary to collect the required data inputs.

Commentary on current use and application

It is unclear how widely this approach has been adopted in Australia to date. The feedback from the survey and interviews suggest that the methodology is not widely used. Some respondents also pointed out that relatively few of the stereotypes are relevant to typical local road networks, which are often low volume and extensively unsealed.

This methodology was also reviewed in Austroads (2022b) to determine if it was suitable for development into an online application. The review noted it is often unclear which stereotype and cross-section is most suitable for a given road environment, and users must make a judgement call on each corridor being assessed. This makes assessing an entire road network, made up of many different stereotypes, a time-consuming process. The report recommended that the process needs further development before it can be adapted into an online tool, including the need to test it on a wider range of road environments and fixing known anomalies identified in Austroads (2020b).

In contrast, WALGA (2023) found the methodology was a low-cost option that requires less time commitment from local government compared to other methodologies like iRAP/AusRAP and IRR. However, the drawbacks to this approach were the lack of training, and the fact there is no software available to streamline the process for users.

Resources and guidance

For more information, refer to Austroads report AP-R619-20: *Network Design for Road Safety (Stereotypes for Cross-sections and Intersections) User Guide* (Austroads 2020b).

Infrastructure Risk Rating (IRR)

Description

IRR is a proactive risk assessment method based on the Star Rating approach of coding road and roadside features to model the underlying risk of a road section. However, IRR requires fewer inputs than Star Rating. These inputs are:

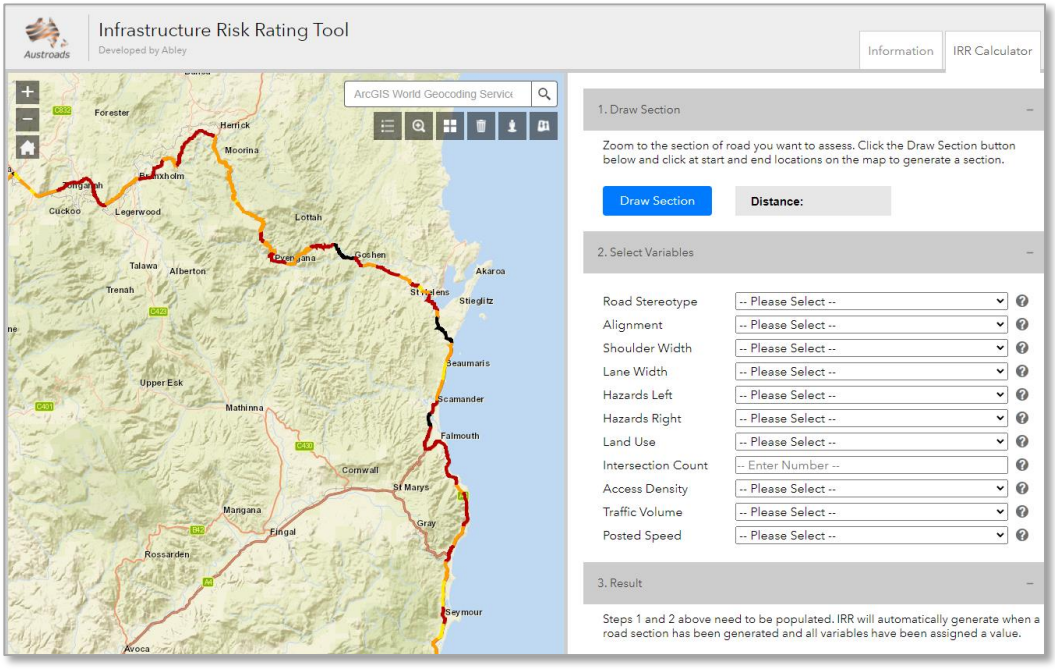
1. Land use
2. Road stereotype
3. Horizontal alignment
4. Lane and shoulder width
5. Roadside hazards
6. Intersection density
7. Access density
8. Traffic volume – rural roads only
9. Speed limit – rural roads only

Prior to assigning these variables to a road network, it is first segmented into homogeneous corridors. A homogeneous corridor has little variation in the road and roadside attributes along its length.

Each attribute is assigned a value based on available categories. These values are entered into the IRR equation to generate an IRR score for a homogeneous corridor, which translates to an IRR band ranging from 'Low' (low risk) to 'High' (high risk).

The IRR methodology was first developed in New Zealand, before being tested and expanded to Australia (Austroads, 2019b). An online IRR tool was developed as part of the 2019 Austroads project which enabled users to calculate the IRR score and band for a segment of road using user-defined inputs. This tool is no longer available.

Screenshot of the Austroads Infrastructure Risk Rating Tool (source: Austroads, 2022b)



An IRR score can be used to estimate FSI crash rates for low volume roads that have little crash history. For example, in New Zealand, a combination of actual FSI crashes and predicted FSI crashes (calculated from IRR) are used to identify baseline risk levels from which potential road safety projects are developed in the government's Speed and Infrastructure Programme (NZ Transport Agency, 2022).

Resources/other requirements

Guidance on IRR is provided by Austroads, including a user guide. State-specific IRR Manuals or Tools are provided in Victoria and Queensland. Note that each state may adapt or calibrate the methodology to suit their road environment or use case. For example, speed limit is excluded in the Queensland IRR methodology (Queensland Government, 2018) because it is used as an input to speed limit setting in that state.

To assess the IRR of a road, information on the coded attributes must be collected, coded, and entered into the IRR formula. This information can be sourced from existing datasets or can be collected from other sources (such as drive-overs or street view imagery).

Roads can be assessed manually, or with an automated process using existing roading datasets (Zia, Durdin & Harris, 2016). The automated approach has been applied in Victoria and New Zealand.

Commentary on current use and application

The IRR methodology has been calibrated for use in Queensland and Victoria (Chhanabhai, Beer, & Johnson, 2017; Zia & Atabak, 2018).

In Queensland, the IRR of a road is required as part of the speed limit review process and a spreadsheet tool is provided for users to calculate the IRR score. In Victoria, the IRR of every state and local road has been assessed using the automated approach, and this information is shared in a map application with local governments. Victoria also provides a spreadsheet tool for calculating IRR for high-speed rural roads, as part of the speed limit review process (Department of Transport, 2021).

IRR is used extensively in New Zealand, with every state and local road risk-rated with IRR. This information is published and regularly updated in the MegaMaps web application (NZ Transport Agency, 2024). IRR is used for speed management (to determine safe and appropriate speeds) and for road safety program development (to assess risk and prioritise sites for treatment).

WALGA (2023b) noted that the data collection and analysis of IRR would cost less and require less time and expertise than iRAP or ANRAM, however it is still likely to be beyond the capacity of some local governments (in WA). It is noted that because the coding of IRR attributes requires some expert knowledge, this should be conducted by a competent road engineer or road safety practitioner.

Resources and guidance

For more information, refer to:

- *Infrastructure Risk Rating Manual for Australian Roads.* Austroads report AP-R587A-19 (Austroads, 2019a)
- [Queensland] *Infrastructure Risk Rating (IRR) Manual.* (Queensland Government, 2018)
- *Road Risk Assessment, Case Studies and Engagement Guidance for Speed Management.* Austroads report AP-R587-19 (Austroads, 2019b).

LG Stars – Safety Ratings Tool

Description

The LG Stars Safety Ratings Tool was developed by WALGA with funding through a Commonwealth Office of Road Safety Road Safety Innovation Grant. The aim of this project was to create a tool to assess the safety of local government roads using a simple and clear methodology, with an assessment method that can be used by local government officers without expertise in road safety engineering. The development of this methodology included an extensive literature review and consultation with local governments in WA. The Tool was launched in mid-2023.

The Tool includes 11 cross-sections for sealed roads and 6 cross-sections for unsealed roads. These range from a divided rural highway with an AADT ≥ 15,000 vehicles per day (vpd), to an unsealed rural access road with < 250 vpd.

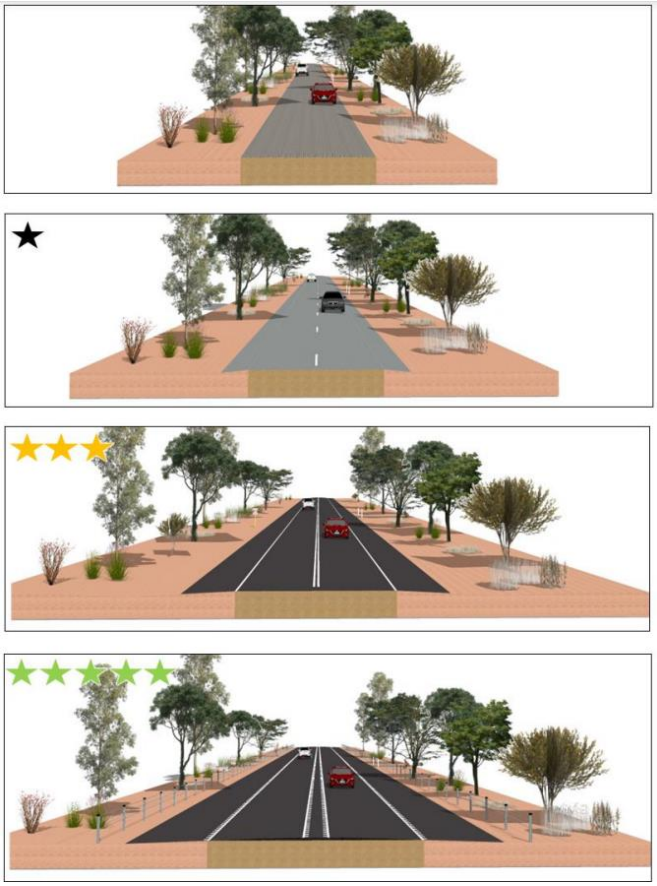
To assess a section of road, users must:

- Look up the cross-section that most closely corresponds to their road.
- Complete a checklist of safety-related criteria for that road and tally the total number of 'ticks' corresponding to the Star Rating in each column.
- Note any possible improvements for that road segment.

The process is repeated to complete an assessment for a road network, which then enables the worst performing segments to be identified.

LG Stars uses a Star Rating approach to risk-rating roads, but this is simplified to 1-Star, 3-Star, or 5-Star only. An additional rating of <1 Star is also provided, recognising that many roads in WA fall below the standard of a typical 1--Star road.

Example of a cross-section, with criteria (source: WALGA, 2023a)



C) Rural Road

Single Carriageway, two-lane, two-way, 110/100/90/80 km/h or less, AADT: 2,000-8,000

Attribute	<1 Star	1 Star	3 Star	5 Star
1. Speed Limit	110km/h	110km/h	90-100km/h	80km/h or less
2. Curvature	Straight or gently curving	Straight or gently curving	Straight or gently curving	Straight or gently curving
3. Skid Resistance	Sealed - poor	Sealed - medium	Sealed - adequate	Sealed - adequate
4. Lane Width	Very Narrow	Narrow	Medium	Wide
5. Roadside Hazards (linked to 11)	0-1m from roadside	1-5m from roadside	6m from roadside	1-5m from roadside
6. Road Condition	Poor	Medium	Good	Good
7. Delineation	Poor	Poor	Adequate	Adequate
8. Number of Lanes	2	2	2	2
9. Carriageway	Undivided road	Undivided road	Undivided road	Undivided road
10. Paved Shoulder	None	Narrow	Medium	Wide
11. Roadside Object (linked to 5)	Tree	Tree	Tree	Safety barrier - wire
12. Shoulder Rumble Strips	Not present	Not present	Not present	Present
13. Centreline Rumble Strips (linked to 14)	Not present	Not present	Not present	Present
14. Median Type (linked to 13)	No Centre line	Centre line	Wide Centre line	Wide Centre Line
15. Property Access Points	Residential 1 or 2	Residential 1 or 2	Residential 1 or 2	Residential 1 or 2

Resources/other requirements LG Stars requires basic information about each road to be collected. Suggested inputs include the Main Roads Road Information Mapping System, Google Maps, existing video data and asset management datasets. WALGA provide online and offline versions of the tool for local government users. Regional Road Safety Advisors at WALGA are working directly with some local governments using LG Stars to assess their road networks.
Commentary on current use and application LG Stars is currently only being used in Western Australia. It is being used by several local governments to assess the risk of their road network, with support from WALGA's Regional Road Safety Advisors. WALGA (2023b) notes that future developments to this project may include: • developing an intersection safety assessment tool • developing a tool to evaluate the effectiveness of different road safety treatments • further evaluation of the tool for application in other jurisdictions (if there is interest outside WA). LG Stars could potentially be expanded for use beyond Western Australia. However it is recommended that further investigations into its suitability for nationwide adoption is undertaken, considering any learnings observed from recent applications in Western Australia.
Resources and guidance For more information and resources on LG Stars, including the offline tool, visit: www.roadwise.asn.au/local-government/lgstars.aspx

2.3 Other risk assessment methods

Other methods considered in this review were roadside risk scoring using the Network Roadside Risk Intervention Threshold (NRRIT) method, and kinetic energy modelling of intersections using X-KEMM-X. Both are established risk assessment methods in Australia but have limitations that make them unsuitable for network risk assessments of local roads.

NRRIT and Roadside Risk Scores

The Austroads *Guide to Road Design Part 6: Roadside Design, Safety and Barriers* (Austroads, 2022a) describe a process to analyse the level of risk associated with roadside hazards along a road segment, within a defined road and roadside cross-section and traffic volume. It includes an evaluation of exposure, likelihood, and severity.

Jurisdictions can set a Network Roadside Risk Intervention Threshold (NRRIT) for different road stereotypes. This can be determined by using corridor safety visions, as part of the Network Safety Plan, to identify typical roadside cross-sections which are used to develop a common target level across the network. Alternatively, jurisdictions can use overriding national practices, jurisdictional policies, or corridor safety visions to determine where barriers should be installed.

Road segments in an investment program or project inherit the NRRIT. The *Austroads Guide to Road Design Part* 6 sets out a process for determining the risk score of a program or project. If the risk score exceeds the NRRIT, then a roadside treatment is required to mitigate the risk to be below the NRRIT (Figure 2.2).

Figure 2.2: Using the roadside risk score and NRRIT for treatment selection (source: Austroads, 2022a)

This method is being adopted by state jurisdictions as part of their road design specifications, including by South Australia and Victoria. Both states have created easy-to-use spreadsheets for users to calculate roadside risk scores[5]. In South Australia for example, the Department for Infrastructure and Transport has published nominal NRRIT scores in their Road Design guidance, for state-maintained roads (Department of Infrastructure and Transport, 2022).

This risk assessment method was reviewed in Austroads (2022b), where it is found that the scoring methodology is quantitative but complicated to apply - requiring users to consult a series of tables, charts, and formulae to determine the roadside risk score.

Although this method was not specifically designed to be applied beyond individual sites, it could potentially be rolled out at a network level. However, the major limitations for this method are:

- It appears to be intended for use primarily for state-managed roads.
- It only evaluates roadside risks for run-off road crashes on roads with high operating speeds (generally ≥ 70 km/h) and cannot be used to assess other types of crash risk.
- The required inputs are potentially harder to assess compared to similar corridor risk assessment methods like IRR and the Austroads Stereotypes. These include factors such as specific traffic counts, grade (%), curve radius, and the average distance to isolated hazards.

Kinetic energy modelling for intersections (X-KEMM-X)

The X-KEMM-X method for assessing the probability of FSI crashes at intersections was developed for the Austroads report *Understanding and Improving Safe System Intersection Performance* (Austroads, 2017). To assess an individual intersection, this method involves:

1. Drawing a conflict diagram for the intersection identifying all conflicting traffic movements (conflict points), including pedestrian movements.
2. Then for each conflict point:
   a) measuring the conflict angles and evaluating impact speeds between vehicles
   b) computing delta-V for each vehicle[6]
   c) calculating the probability of an FSI for each vehicle using the graphs provided
   d) combining probabilities to estimate overall FSI probability.

[5] These spreadsheets are publicly accessible can be freely downloaded. Click here to download the spreadsheet for South Australia, and here for Victoria.
[6] Delta-V is the measured change in velocity experienced by a vehicle (or other road user) during a crash, which is highly correlated with injury risk. The X-KEMM-X method includes equations to assist with the calculation of delta-V for each potential conflict.

The X-KEMM-X process provides a risk metric that enables the comparison of different sites, and different designs, however it requires a lot of effort and a reasonable level of expertise to undertake the assessment. There are also several assumptions in the model, including that all vehicles involved in the conflict have equal mass. For these reasons X-KEMM-X is better suited to evaluating individual sites or for comparing different intersection designs – rather than being applied at a network level.

2.4 Assessment of existing risk assessment methods

This section compares each risk assessment methodology, considering local government requirements.

Table 2.2 is an assessment of the operational requirements of each method that WALGA undertook to assist in the development of LG Stars (excluding reactive, crash-based methods) (WALGA, 2023b). This assessment generally reflects the complexity of the methodology – with more advanced and complex methods scoring more 'red' ratings. WALGA intentionally developed their LG Stars method to be 'green' across all criteria, that is:

- requiring a low level of road safety expertise,
- requiring little training and no accreditation,
- little time commitment,
- relatively low cost,
- the ability to use existing data sources, and
- support available to users.

This assessment provides a baseline for understanding which assessment methods are most suited to local governments with limited capability or capacity.

Table 2.2: Assessment of existing risk assessment methods against operational requirements (source: WALGA, 2023b)

Operational requirement	*iRAP / AusRAP*	*ANRAM*	*IRR*	*Road Stereotype*
Road safety expertise	HIGH	HIGH	MODERATE	MODERATE
Training	YES	YES	NO	YES
Accreditation	YES	NO	NO	NO
Time commitment	HIGH	HIGH	MODERATE	LOW
Cost	HIGH	HIGH	MODERATE	LOW
Instrumented survey vehicle	YES	NO	NO	NO
Route must be driven	YES	NO	NO	NO
Existing data sources can be used successfully	NO	NO	YES	YES
Software available	YES	YES	UNCLEAR	NO
Support available	YES	SOME (ARRB)	UNCLEAR	SOME (ARRB)

Table 2.3 expands on the WALGA assessment by considering how fit-for-purpose each method is for different types of road environment and road risk factors, and other relevant considerations. This table also includes reactive risk assessments, and the LG Stars method. This table uses the same colour scale as Table 2.2.

Table 2.3: Assessment of existing risk assessment methods against additional fit-for-purpose factors

Suitability	Reactive approaches (crash-based)	Proactive approaches				
		iRAP / AusRAP	ANRAM	IRR	Austroads Stereotypes	LG Stars
For intersections	Variable (depending on traffic volume)	Moderate	Moderate	Poor	Poor	Poor
For low volume roads	Poor	Moderate	Poor	Moderate	Poor	Good
For unsealed roads	Poor	Poor	Poor	Moderate	Poor	Good
For urban roads (i.e., vulnerable road users)	Variable (depending on traffic volume)	Moderate	Unclear	Poor	Unclear	Moderate
For rural roads	Variable (depending on traffic volume)	Good	Good	Good	Good	Good
Quality of output (e.g., accuracy of risk assessment)	Moderate, except on lower volume roads	Good	Good	Moderate	Moderate	Moderate
Can be automated or scaled across an area?	Yes	Potentially with AiRAP	Unclear	Yes	No	No
Can be used anywhere in Australia?	Yes, provided crash data is available	Yes	Yes	Yes	Yes	Developed for WA specifically
Can be used to test help identify infrastructure treatments?	Only for sites with a crash history	Yes	Yes	Yes	Yes	Yes
Can be used to generate FSI reductions? (for interventions)	Only for sites with sufficient crash history	Yes, for example with ViDA	Yes	Where the relationship between IRR score and FSI has been evaluated[7]	Yes, albeit simplified	No

Table 2.3 shows that each method has pros and cons. **Given the range of local government roads in Australia, it is clear there is no single method that is 'fit-for-purpose' for every local road. The definition of 'fit-for-purpose' for risk assessment therefore needs to be flexible for the range of local government road environments that exist in Australia.**

[7] Formulae to convert IRR scores to predicted personal risk (e.g. FSI/100 million VKT) have been developed in New Zealand and in Victoria. These were developed by analysing the relationship between the IRR, and crash history.

Some methods are at least moderately suitable for assessing risk at intersections or for assessing the risk of urban roads – but no single method is considered 'good' at assessing intersection or urban road risk. It is recommended that further work be undertaken to improve risk assessment methodologies for these road environments. Until such methods are developed, Section 5.4 identifies interim approaches for assessing risks on local road networks where the predominant systemic risks are at intersections or involve vulnerable road users.

2.5 Categorising proactive risk assessment methods

Risk assessment methods can generally be grouped into one of three tiers, considering their input requirements and scale of assessment, to ascertain their 'fitness' for different types of road environment, as follows:

- **Tier 1:** Basic methods
- **Tier 2:** Intermediate methods
- **Tier 3:** Advanced methods

- Tier 3 methods require the most effort in terms of data collection and analysis. These methods generate a rich and detailed dataset that provides the highest quality of risk assessment. By contrast Tier 2 methods require minimal effort and are easier to undertake but generate a much coarser level of risk assessment output.

Table 2.4 highlights the key differences between each Tier and identifies which proactive methods (for assessing corridor risk) fit within each Tier.

Table 2.4: Categorising risk assessment methods: a tiered approach

Characteristics	Tier 1: Basic	Tier 2: Intermediate	Tier 3: Advanced
Scale	Large (networks)	Moderate (corridors)	Small (100m sections)
Data requirements	Few inputs (< 8). Requires minimal data collection or basic knowledge of the road network.	Several inputs (8-12). Requires some data collection or good knowledge of the road network.	Many inputs (50+). Requires detailed or specialist data collection.
Predictive capability	Low/none – cannot be used to predict FSI or FSI reduction potential.	Moderate – can be used to estimate baseline FSI and FSI reductions for different infrastructure treatments.	High – can generate baseline FSI and accurately predict FSI reductions for different infrastructure treatments.
Proactive methods in this category	• LG Stars (WA)	• Infrastructure Risk Rating • Austroads Stereotypes	• RAP methods (iRAP, AusRAP, AiRAP) • ANRAM

A key characteristic highlighted in Table 2.4 is 'predictive capability'. This refers to the degree to which each method can be used to predict the baseline level of risk, or number of FSI, that might be expected in the future. This information is needed to assess the FSI reduction potential of road safety treatments, which can then be used to assess the Benefit-Cost-Ratio (BCR), if desired. These metrics are required for different infrastructure treatments and projects to be quantitatively prioritised (ranked) against each other, for example as part of a Network Safety Plan, or to support an application for funding under the Black Spot program.

Tier 1 methods: network-level assessments

Historically, the development and use of proactive risk assessments focused on assessing the 'personal risk' of higher volume roads, on a section-by-section basis (e.g., the AusRAP/ANRAM approach). This approach is generally unsuitable for low volume local roads (e.g., < 500-1,000 vehicles

per day) where there are relatively few FSI crashes (in total), dispersed widely across a local road network. Applying a Tier 3 approach to assessing risk is out of proportion to the scale of the trauma for these roads. A Tier 2 approach may be appropriate if there are good data on the road and road environment to input into an IRR model, or to assess the road stereotype with the Austroads stereotypes approach).

Rather than assessing each low volume road separately, as in the Tier 2 or 3 approaches, a Tier 1 assessment can be undertaken at a network level considering the key systemic risks for different types of low volume road. This information is then used to develop treatment programs that are focused on addressing systemic risks by road stereotype at a network level using a speed management or mass action approach. An example of this approach is shown in Table 2.5 for low volume urban and rural roads.

Table 2.5: Systemic risks for low volume roads, with treatment options

Low volume road stereotype	Dominant systemic risk	Network-level treatments
Rural roads	Single vehicle run-off road crashes	• Centre and/or edgeline marking (sealed roads) • Signing sharp curves and other hazards • Guideposts • Drainage improvements (unsealed roads) • Speed limit reduction
Urban roads	Vulnerable road users	• Local area traffic management (LATM) • School safety improvements • Speed limit reduction

The WALGA LG Stars approach integrates this thinking into their risk assessment methodology, which includes a range of unsealed road stereotypes and incorporates a <1 Star rating, recognising that many roads in Western Australia fall below the standard of a typical 1--Star road. A limited range of attributes is used in the assessment of lower volume roads. WALGA notes that:

> *"Particularly in regional and remote Local Governments, many of the roads may be very similar and may have similar attributes (and thus similar Star Safety Ratings). This may make programming improvements difficult… If possible, programming and implementing a treatment across the entire network is preferable to investing heavily in single road segments at the expense of more network-wide solutions." (WALGA, 2023a)*

Once the stereotype and systemic risks are defined, WALGA's simplified LG Stars approach can be used to help prioritise which types of roads (or areas) to treat first, for example by addressing those roads where infrastructure is most lacking.

Note that systemic risks for some low volume roads may be localised or only relevant to some LGAs. Examples include low volume roads:

- where volumes fluctuate seasonally, e.g., providing access to remote recreational areas
- predominantly used by heavy vehicles, e.g., providing access to quarries or mines
- that are school bus routes, e.g., where vulnerable road users may be present at certain times and days
- around schools and community hubs where vulnerable road users are present, and traffic volumes fluctuate at certain times of the day or week.

2.6 Combining proactive risk assessments with reactive risk assessments

Best practice in risk assessment indicates there is value in considering both reactive (crash-based) and proactive risk metrics, acknowledging the limitations of using crash data to predict future road safety risks. Two approaches for combining proactive and reactive risk assessments are identified and discussed below.

Scaling risk metrics by traffic volume

This approach can be used for road networks where the traffic volume for every road is known (or estimated), and a Tier 2 or Tier 3 proactive risk method used to generate an FSI metric (e.g. estimated FSI per 100 million VKT).

The output risk metric is scaled between the proactive and reactive approaches, with a higher weighting on reactive risk for higher volume roads, and a higher weighting on proactive risk for lower volume roads. The weighting approach is used to demonstrate the level of confidence that can be placed on historic injury crash data as an indicator of the underlying level of risk based on the level of traffic volume exposure.

Known examples of this approach have been applied to local roads in Victoria and New Zealand.

Using risk metric thresholds

This approach involves setting a minimum threshold for a site or corridor to be considered ‘high risk’, based on either proactive or reactive risk metrics. For example, the Black Spot Program provides options for nominating sites based on casualty crash history, or by using a proactive approach.

3. Local government survey

An online survey targeted to all Australian local governments was undertaken to determine whether they conduct 'fit-for-purpose' road safety risk assessments, and if so note:

1. The percentage of their road network assessed in the previous year.
2. The methodology (or methodologies) they use to conduct road safety risk assessments.
3. How the assessments inform road safety planning and investment.
4. What skills, capabilities and support they need to start to deliver fit-for-purpose road safety risk assessments and integrate these into decision making or increase the percent of their network assessed per annum.

3.1 Methodology

A series of questions was developed to address the survey requirements (refer Appendix A). The survey was designed with two branches of questions, with questions varying depending on whether the local government had undertaken a risk assessment (or not). The survey was also designed to be quick and easy for respondents to complete, to encourage a wide range of local governments to respond.

The survey was delivered via SurveyMonkey and open between 15 April 2024 and 10 May 2024. It was promoted to local governments across many channels, including direct email and via industry forums. Further information on how the survey was promoted is also provided in Appendix A.

3.2 Response rate

A total of 103 responses, representing 114 councils, were received during the survey period[8]. Table 3.1 and Table 3.2 show the split and percent of responses, by state and by type of local government. Overall, the survey had an effective response rate of 21.3 percent.

[8] One survey respondent represented a group of 12 separate local governments, but only submitted one response.

Table 3.1: Local government survey response by state

State/Territory[9]	Total local government responses received	Total number of local governments	Effective response rate
New South Wales (NSW)	27	128	21.1%
Northern Territory (NT)	1	17	5.9%
Queensland (QLD)	8	77	10.4%
South Australia (SA)	31	68	45.6%
Tasmania (TAS)	6	29	20.7%
Victoria (VIC)	26	79	32.9%
Western Australia (WA)	15	137	10.9%
TOTAL	**114**	**535**	**21.3%**

Table 3.2: Local government survey by type of local government

Type of local government	Total responses received
Metropolitan	23
Metropolitan fringe/peri-urban	7
Regional town/city	18
Large rural shire/council (population >5,000)	32
Small rural shire/council (population <5,000)	14
Agricultural	2
Remote	5
Other/unsure	1 + 12 (mixed)

As shown in Table 3.1, the states with highest number of responses (effective response rate) were South Australia, Victoria, and New South Wales. The most common types of local government that responded were metropolitan, large rural shires/councils, and small rural shires/councils (Table 3.2).

[9] The Australian Capital Territory (ACT) is omitted from this table as there is no local government in this Territory.

3.3 Results

Local governments that have done network risk assessments in the past 12 months

Respondents were asked to identify whether they had undertaken a network risk assessment for all, or part of their road network, in the past 12 months. The number of local governments that responded 'yes' to this question are shown in Table 3.3.

Table 3.3: Local governments that have completed a network risk assessment, by state

State/Territory	Total responses received	Total number of local governments doing network risk assessments
New South Wales (NSW)	27	7
Northern Territory (NT)	1	0
Queensland (QLD)	8	2
South Australia (SA)	31	12
Tasmania (TAS)	6	1
Victoria (VIC)	26	12
Western Australia (WA)	15	13[10]
TOTAL	**114**	**47**

Table 3.4 shows the number of local governments that have completed a network risk assessment, by type of local government. This table shows that network risk assessments are predominantly completed by local governments who described themselves as metropolitan, regional town/city, or large rural shire/council.

Table 3.4: Local governments that have completed a network risk assessment, by type

Type of local government	Total responses received	Total number of local governments doing network risk assessments
Metropolitan	23	12
Metropolitan fringe/peri-urban	7	2
Regional town/city	18	9
Large rural shire/council (population >5,000)	32	9
Small rural shire/council (population <5,000)	14	2
Agricultural	2	1
Remote	5	0
Unknown/not reported	13	12
TOTAL	**114**	**47**

[10] One respondent represented 12 councils in WA and identified up to 20% of their road networks had been assessed.

Familiarity with different assessment methods

All respondents were asked to rate their familiarity with a list of existing risk assessment methods. Figure 3.1 shows the percentage of respondents who rated their familiarity with these methods as *'somewhat familiar'*, or '*very familiar'*. The responses are split by whether the respondent stated that the local government had undertaken a network risk assessment.

Figure 3.1: Familiarity with network risk assessment methodologies

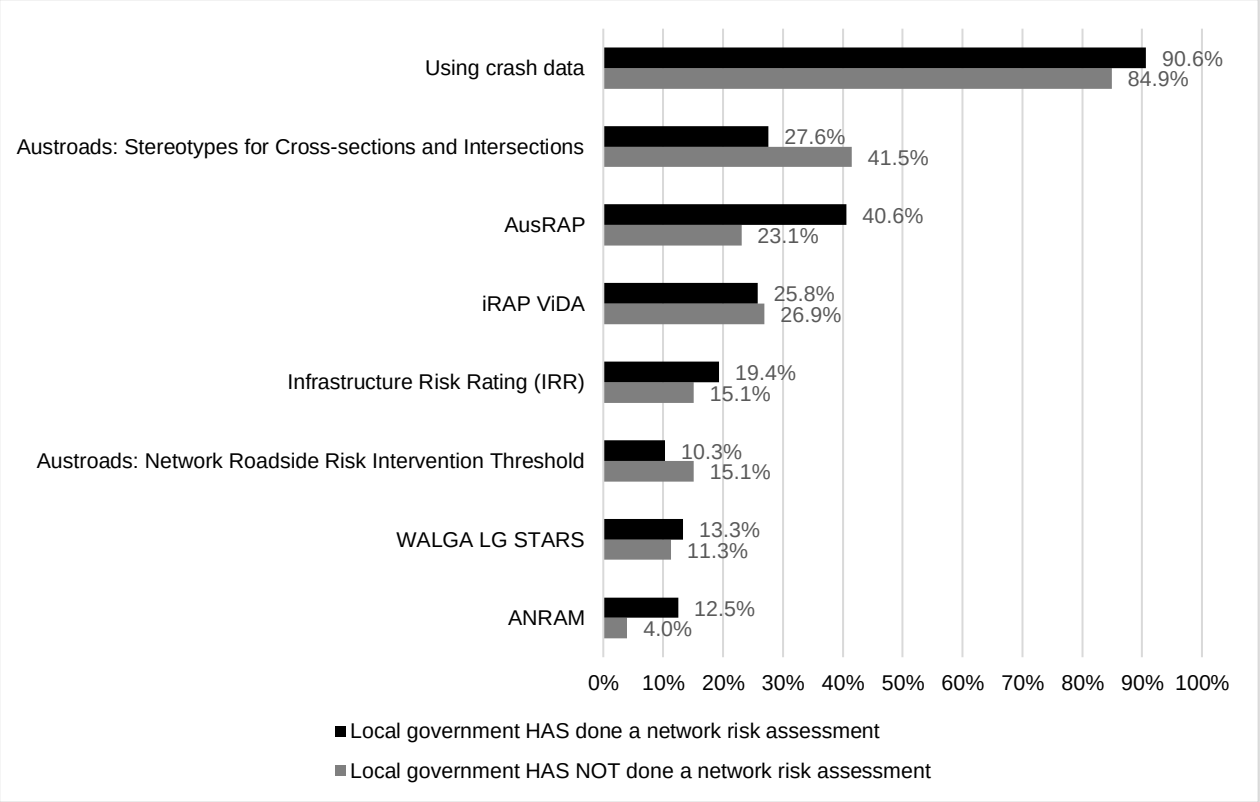


Figure 3.1 clearly shows that respondents were most familiar with using crash data for risk assessments. The responses between groups are relatively similar for other methods, although it is noted that:

- Respondents from local governments that have done network risk assessments were generally more familiar with AusRAP, IRR and ANRAM methods.
- Respondents from local governments that have not done network risk assessments were generally more familiar with the Austroads methodologies (Stereotypes for Cross-sections and Intersections, and Network Roadside Risk Intervention Threshold).

Challenges for local governments doing assessments

Respondents were asked to rate the degree to which they agree with several statements regarding challenges facing local governments in doing network risk assessments.

Figure 3.2 and Figure 3.3 show the responses to these statements from local governments that have done or not done network risk assessments respectively.

Figure 3.2: Perspectives of challenges (feedback from local governments who have done an assessment)

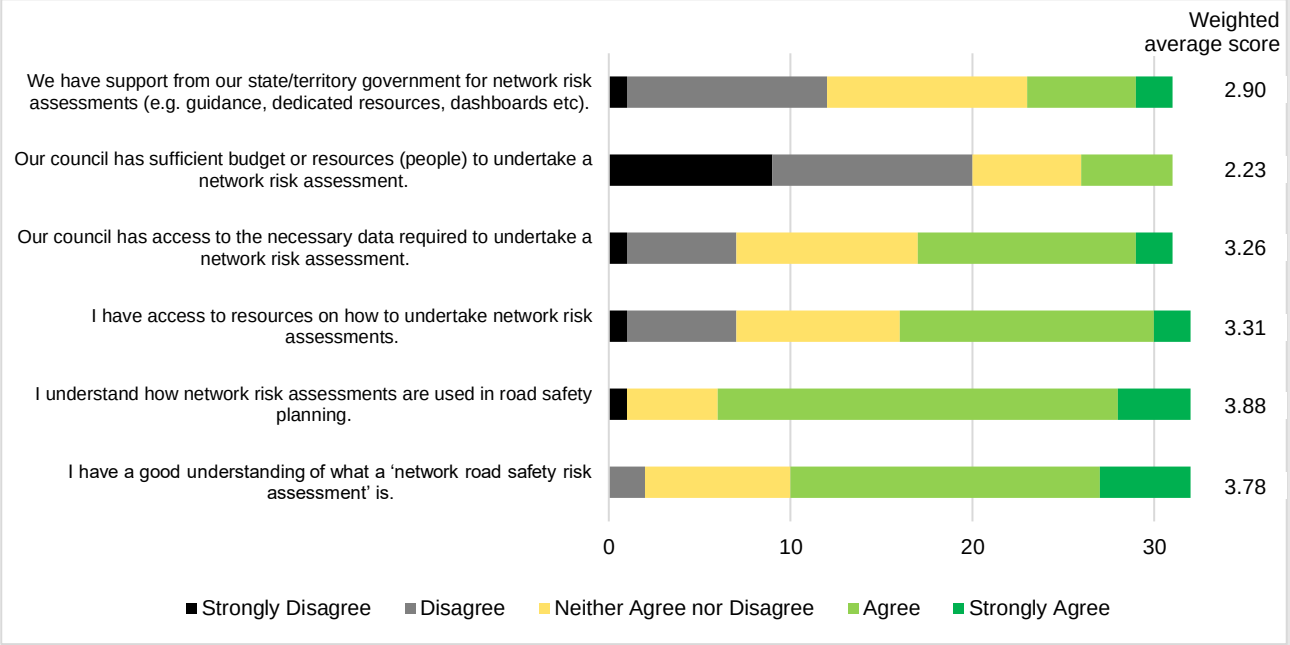
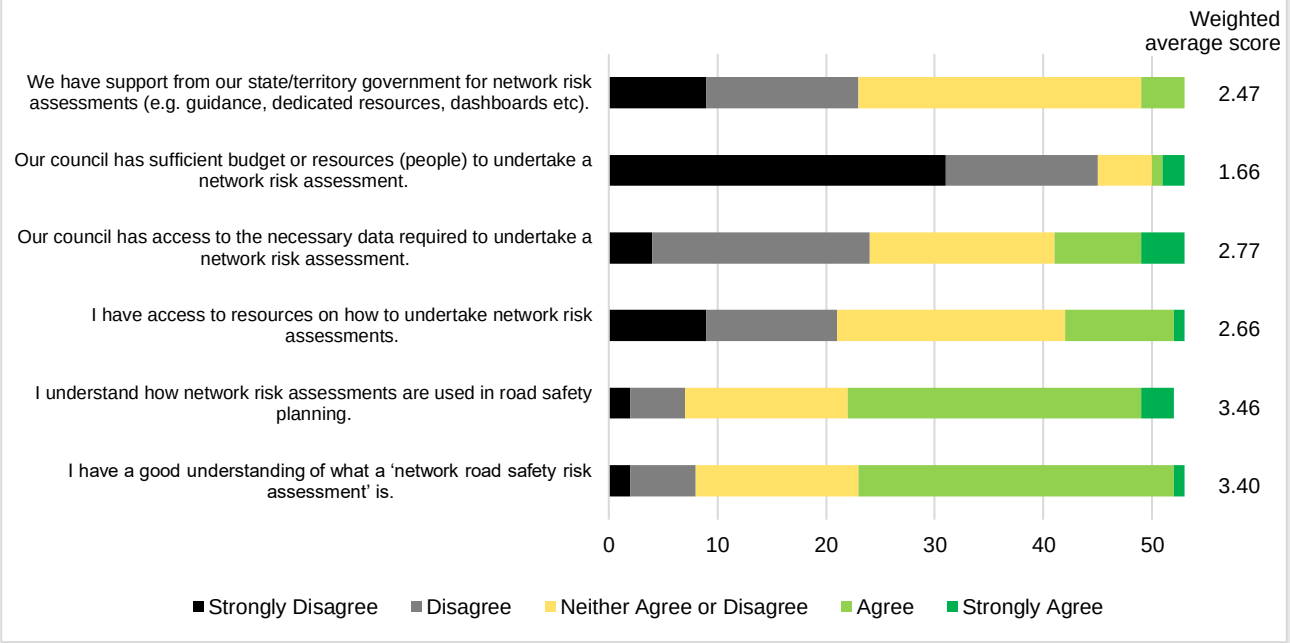


Figure 3.3: Perspectives of challenges (feedback from local governments who have not done assessments)



Across both groups, respondents were most likely to disagree with the statement "*Our council has sufficient budget or resources (people) to undertake a network risk assessment*".

Most respondents agreed, or strongly agreed with the statements "*I understand how network risk assessments are used in road safety planning*" and "*I have a good understanding of what a 'network road safety risk assessment' is."*

There is a clear distinction in the perception of challenges between both groups. Participants from local governments that have done network risk assessment were more likely to agree, or strongly agree that:

- they had support from their state/territory government
- they had sufficient support or resources (people) to do a network risk assessment
- they had access to data and other necessary resources.

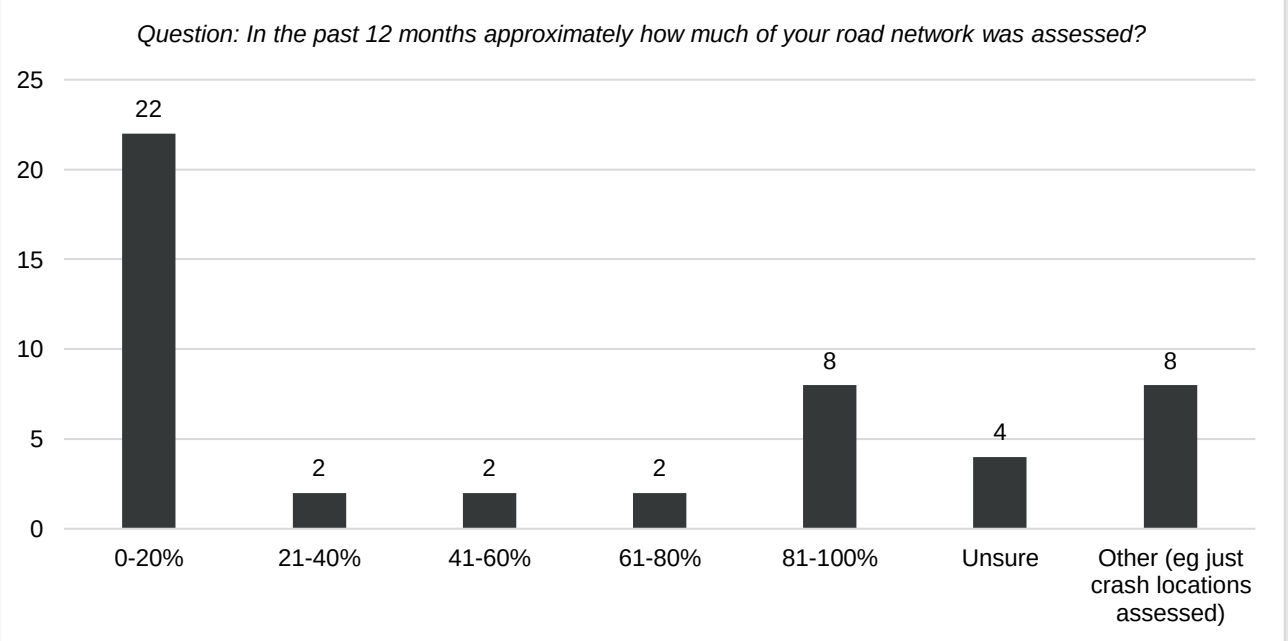
Findings: local governments that have undertaken risk assessments

This section summarises responses to questions that were specifically targeted to local governments that had undertaken risk assessments.

Percent of network assessed

Figure 3.4 shows that most respondents have assessed a relatively small portion of their network (< 20 percent), although eight local governments indicated they had assessed most or all (81-100 percent) of their road network. Most of those who selected 'other' noted they either used crash data to identify blackspots or only undertook assessments at locations where there was an identified crash problem.

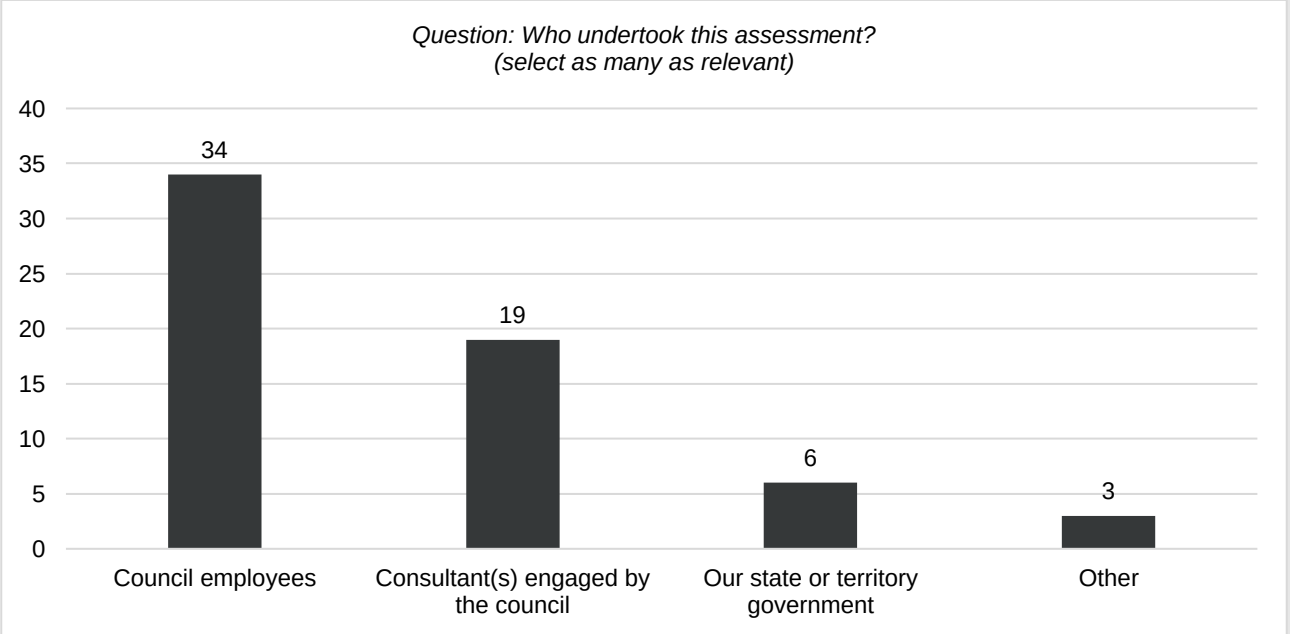
Figure 3.4: Length (%) of network assessed



Who undertook the assessment

Figure 3.5 shows that most respondents identified council employees as undertaking these assessments, although consultants are also commonly used.

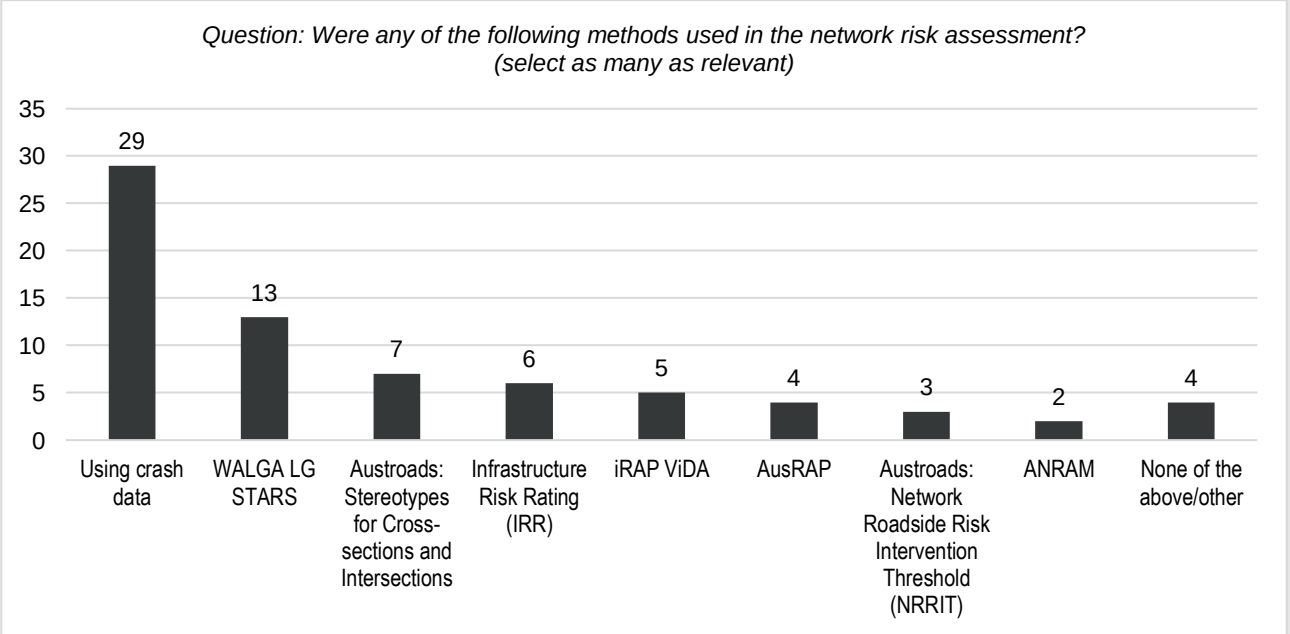
Figure 3.5: Who undertook the network assessment



Assessment methods used

Figure 3.6 shows that most local governments use crash data for their network risk assessments, although the WALGA LG Stars approach is also popular (in Western Australia). Note that respondents could select multiple answers for this question.

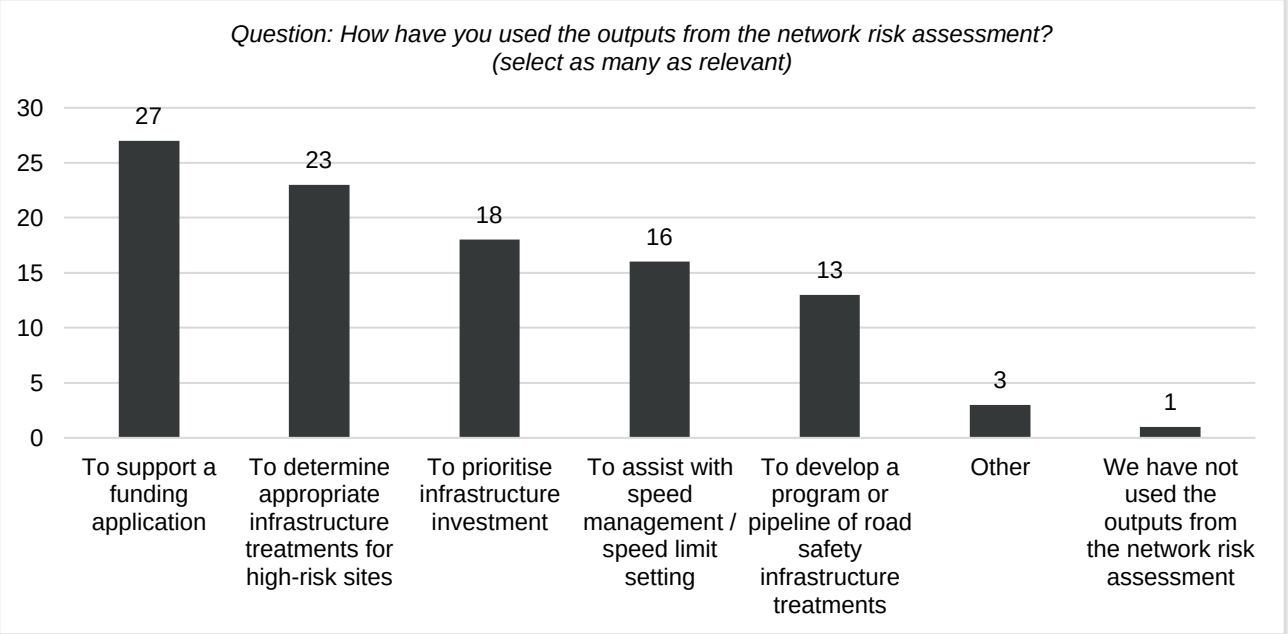
Figure 3.6: Assessment methods used



How network risk assessments are used

Figure 3.7 shows that network risk assessments are used for a range of purposes, with most risk assessments being undertaken to support a funding application, and to determine appropriate infrastructure treatments for high-risk sites. Note that respondents could also select multiple answers for this question.

Figure 3.7: How outputs of assessments are being used



Resources and guidance used in assessments

Respondents were asked to identify the resources and guidance they used to help in their assessments. This question was a free text question, and 21 respondents answered this question.

Two common themes emerged from the comments received, that:

- they used data supplied by the state/territory (predominantly crash data), and/or
- they employed a consultant (to undertake an assessment, inspections and/or for reporting).

What is needed to improve or expand assessments

Respondents were also asked what they needed to improve or expand their assessments and 23 respondents answered this question. The key themes from the comments provided were:

- more funding
- more staff (and particularly staff with sufficient road safety knowledge)
- data availability (data access, sharing, and funding for data collection).

Findings: local governments that have not undertaken risk assessments

Most (57 percent) local governments surveyed stated that had not undertaken a risk assessment in the past 12 months (or were unsure if they had undertaken this assessment). The responses to questions specifically targeting these local governments are summarised below.

Awareness of specific resources

Respondents were asked if they were aware of any specific resources (guidance, training, tools, dashboards etc.) that were available to assist them with their network risk assessments. This question was an optional free text field, and 24 respondents provided an answer.

Two strong themes emerged from the comments received, that:

- they were not aware of any specific resources, and/or
- they were generally familiar with resources, guides, training etc. for road safety audits and safe system audits (noting these are not used for network risk assessment).

Resources or support required

Respondents were also asked to comment on what resources or support would be most helpful to them, or their organisation, to assist with network risk assessments. This question was an optional free text field, and 45 respondents provided an answer.

Two clear themes emerged from this feedback, that there was a strong need for both:

- funding or assistance with costs, including funding for external assessments; and
- resourcing (access to skilled or trained staff).

Other comments also highlighted a need for:

- an agreed method or process for assessment, including policy or procedural requirements
- guidance materials (e.g. online documents)
- training
- user-friendly tools.

4. Stakeholder interviews

The purpose of the interviews, as defined in the project brief, was to help:

1. Identify the different road safety assessment methodologies currently being used in Australia by state/territory and local governments.
2. Recommend a methodology-neutral, practical definition of 'fit-for-purpose' road safety risk assessment that can be used by the variety of public road management authorities across Australia, from major capital cities and metropolitan areas to the most remote and least resourced areas of Australia.
3. Identify the skills, capabilities and support local governments require to develop 'fit-for-purpose' risk assessments.

The project brief included scope for up to 40 one-on-one interviews. These interviews were split into two stages (or rounds):

a) **Round 1:** Interviewing a range of governments (state/territory and local) and local government associations to get a broad understanding of key themes and issues. These interviews were undertaken from mid-April to early May 2024. The findings from these interviews are presented in this section of the report.

b) **Round 2:** The purpose of this round was to elicit further feedback on the draft deliverables. A subset of interviewees from Round 1 were selected for these interviews. The findings from these interviewees are not reported separately but helped informed the 'fit-for-purpose' definition of risk assessment for local government (refer Section 5) and the frameworks for supporting local government (refer Section 7).

This section reports on the methodology and results from the Round 1 interviews.

4.1 Methodology

Selection of interviewees

Interviews were sought from representatives in the following organisations:

- state and territory governments
- local government associations
- local governments

The selection of interviewees for each type of organisation is described in Table 4.1.

Table 4.1: Interviewee selection methods

Organisation type	Contact or selection method
State and territory governments	Representatives from every state and territory government were identified and contacted via email. These representatives were identified from industry networks, and from the ACRS membership list.
Local government associations	Every local government association in Australia was contacted via email, including state/territory associations and ALGA. A follow-up phone call and/or email was made to contact those associations that did not respond to the initial request for an interview.

Organisation type	Contact or selection method
Local governments	Interviews with a range of local governments (by state, size, and remoteness) were sought using the following methods: • Sharing an expression of interest form to local governments via the ACRS membership contact database. • Seeking recommendations from state/territory representatives and local government associations (about suitable local governments to interview) • Direct contact via phone or email (targeting specific local governments to address a gap in type or location).

Using this selection methodology, a total of 25 interviews were undertaken in Round 1. These included interviews with:

- every state and territory government (nine in total)
- five local government associations, including the Australian Local Government Association
- 11 local governments, including at least one local government from every state/territory[11], and at least one local government covering each remoteness classification[12].

Interviewing method

The interviewing was undertaken using a semi-structured approach. Semi-structured interviews typically use open-ended questions, based on a general set of questions covering the topics to be discussed. Different questions were developed for each type of interview. These are provided in Appendix B.

These questions helped guide the interview but did not limit the scope of the discussion. For example, if there were topics that an interviewee had experience or expertise in, then a deeper discussion of those topics was facilitated.

All interviews were recorded with the permission of the participants involved.

Analysis of interview feedback

The interviews were transcribed and thematically analysed using an inductive approach - letting the interview feedback determine key themes (as opposed to coding feedback based on preconceived themes or ideas).

The text from each interview was reviewed and common topics, ideas and recurring responses were coded (labelled). The coded responses were then grouped into themes which represented broad topics.

[11] Excluding the Australian Capital Territory which does not have any local government.
[12] From the Australian Bureau of Statistics Maps of Remoteness Areas: https://maps.abs.gov.au/index.html. Remoteness area classifications are: “Major Cities”, “Inner Regional”, “Outer Regional “, “Remote” and “Very Remote”. Note that many of the local governments interviewed straddled more than one remoteness area boundary, for example a local government could straddle both an “Inner Regional” and “Outer Regional” area.

4.2 Interview findings

The following common themes were identified across the interviews:

1. **Governments that are doing (or not doing) risk assessments** – covering feedback on which governments are doing/not doing network risk assessments; as well as common factors among those governments that are doing assessments.
2. **Risk assessment methods** – covering the type of different risk assessments being used, as well as discussions about what 'fit-for-purpose' means for different types of local government.
3. **Data for risk assessments** – covering topics such as data provision, data sharing, and data gaps for network risk assessments.
4. **Capability and capacity** – covering feedback on funding, competing priorities for local governments and the availability of knowledge staff to undertake network risk assessments. This theme also includes feedback on the support that local government needs to undertake or expand these assessments.
5. **Road safety programs and infrastructure funding** – this theme group collates feedback about the role of network risk assessments in road safety infrastructure programs, and how risk assessments are used (or could be used) to seek funding for interventions.
6. **Beyond risk assessments** – this theme collates feedback on how network risk assessments are used and interpreted more broadly, including to inform treatment selection.

Shared topics and feedback under each theme group is reported using these theme groups in the sections that follow.

Theme 1: Governments that are doing (or not doing) risk assessments

All the state and territory governments spoken to were currently conducting or have conducted AusRAP, AiRAP or ANRAM assessments for their state or territory managed road networks.

The local government interviewees had conducted varying levels of risk assessment. Most participants interviewed largely rely on reactionary (crash-based) methods to determine high-risk sites on their road network. This is primarily due to funding requirements under the Black Spot Program being largely reactionary. However, some local governments have worked with ARRB/NTRO using their NetRisk2 product to assess some or part of their road network. Other local governments are participating in trials by the state government looking using IRR or AusRAP.

Theme 2: Risk assessment methods

Among the local governments spoken to, AusRAP, ANRAM and AiRAP appeared to be the most widely known and used risk assessment methods. Some local governments had used it on part of their network as a trial. Users of the AusRAP methodology had generally employed consultants to undertake the data collection and analysis.

NetRisk2, a product by ARRB/NTRO, was widely used by local governments. NetRisk2 is a combination of AusRAP and ANRAM methodology. Councils often engaged ARRB/NTRO to carry out these assessments using their tool where data are already available from asset management data collection.

The Department of Transport and Main Roads Queensland noted they were currently undertaking a trial of IRR on state and local roads with some local governments taking part. Some local government interviewees said they found the Austroads IRR tool to be useful, as it is a free tool on the Austroads website. They generally use it on a site-by-site basis to inform changes to speed limits, to support funding applications, and to see how changes to the road environment would affect the risk rating. The Victoria Department of Transportation and Planning have developed an intersection collective risk model and carried out an IRR assessment for all declared (state) and local government roads in Victoria.

The Western Australia Local Governments Association (WALGA) created a risk assessment methodology specific to local government, called LG Stars. WALGA has a RoadWise team made up of Road Safety Advisors who support local governments to implement LG Stars. WALGA stated that 17 local governments have expressed interest or started working on their network using the LG Stars framework. For those local governments, a Road Safety Advisor is available to help them with their assessment for one week every two to three months. Some local governments use this additional resource to 'chip away' at risk assessing their network. In other cases, the Road Safety Advisor works to build the capability of local government staff to enable them to do their own LG Stars assessment or supports them with other road safety targets.

It was noted by several interviewees that existing risk assessment methods primarily deal with midblock sections of road and do not have specific risk assessment methodologies for intersections, which can often represent a significant proportion of the road trauma problem. One interviewee noted that as AusRAP reports at a segment level, they believed safety issues at intersections were being masked.

The Austroads Stereotypes and Cross-sections risk assessment method had also been used by local governments, but generally found to not be nuanced enough to usefully interpret. For example, there are several stereotypes for higher volume highways and arterials roads but relatively few stereotypes for the range of lower volume roads that typically make up most of a local road network.

Many interviewees noted they would like to repeat risk assessments every five to ten years, however they are unsure if that will be feasible with the costs associated with this.

Theme 3: Data for risk assessments

Crash data are held by the state or territory government and shared through various means to local governments. These data are provided with varying levels of access and detail. One state/territory government provides crash data on request and does not have a state-wide tool for local governments to use. Some local governments use publicly available crash data and contact the state authority if they require further detail.

The quality of the available data varies between states and territories, and not all data collected at that level are shared with local governments. Concern was raised that many cycling, e-scooter or minor vehicle crashes were not captured in the crash data, leading to an incomplete picture of safety on the road network.

Asset information is also lacking for some local governments that do not strategically collect asset data. Therefore, those councils rely on visual feedback from maintenance teams, and feedback from the community to understand the condition of their road environment as data on the assets are collected on an ad hoc basis.

<u>Barriers and opportunities</u>

Local government interviewees highlighted funding, cost, lack of staff and having other priorities as barriers to collecting the data required for risk assessments. Some councils outsource their data collection to consultants such as ARRB/NTRO who collect video data for asset management or risk assessment purposes.

Two local government interviewees described having had data collected for a different purpose (such as road condition assessments or for investment strategies), which was repurposed for the risk assessment. This reduced the cost of doing the network risk assessment as they did not need to fund additional data collection specifically for this purpose.

Main Roads Western Australia are collecting LiDAR data for their state road network to undertake an AiRAP assessment and are sharing the data more widely within the organisation for other purposes such as bridge inspections and stormwater management. LiDAR data collection is costly, and this approach showed the wider organisation the value of collecting data for use in different applications.

It was also noted that data collected for risk assessments could be used for other planning purposes, such as for disaster management or stormwater management investment planning where flooding is a hazard. However, one interviewee also noted that although the data could be used for other purposes, still "it costs a fortune, we can't afford that".

Theme 4: Capability and capacity

Local government – capacity

Every local government interviewee commented on the lack of time and having other priorities as factors that make undertaking risk assessments difficult. It was commonly noted that among local government practitioners:

- They didn't have time to prepare grant applications for funding programs (and some outsourced the proposal development process for this reason).
- Being resource-challenged makes it difficult to be proactive, as most of their time is spent being reactive (responding to problems and requests as they arise).
- They needed support from colleagues or managers to prioritise road safety. Those that had the support of their managers were given the time and/or resources to be more proactive.
- Unless a road safety matter was extremely urgent, many councils didn't have the resources to address it.

Producing funding applications, particularly for the Black Spot Program, is resource intensive. Some interviewees noted that larger councils with more resources could either outsource the application process or hire dedicated staff for producing applications. This saves them time and allows them to prioritise their efforts where required. It also means that those councils with the resources to prepare funding applications, were more likely to receive funding.

Interviewees from local governments in regional areas expressed that because they are small councils with extensive road networks, they must prioritise their work. Small councils also said that they struggle to attract engineers and planners as they are unable to offer salaries that are competitive with consultants, or neighbouring metropolitan councils. Therefore, while councils in regional areas generally want to be more proactive in their approach to road safety, they often lack the resources to do so.

Some interviewees noted that sharing resources (people) between neighbouring local governments, with support from state and territory governments, could help the resourcing challenges faced by local governments. In some cases, local government associations have provided additional part-time resources to councils to support them in delivering road safety programs.

Local government capability (road safety knowledge and skills)

Most of the local government interviewees had a good understanding of road safety, including knowledge about how to identify high-risk locations and carry out road safety audits. Most state and territory governments, and some local government associations, provide support for local governments with guidance and training relating to road safety auditing, the safe system, and treatment selection.

Some interviewees were interested in a framework and training for risk assessments as they would like to be proactive, but are constrained by their capacity, capability, and funding. Small councils that have limited staff looking after the full breadth of road management activities are particularly reliant on support from state/territory governments or need to contract a consultant to do specialist road safety work.

The skills and knowledge held by local governments is also highly affected by turnover in staff. For example, if the council's only road safety auditor moves to a new region, that loss in safety knowledge is often hard to replace.

Some local governments require specialised guidance due to the uniqueness of their network. This includes regions with significant unsealed/unformed road networks, or heavy vehicle traffic (road trains).

Local government – funding for risk assessments

Interviewees from local government strongly expressed that network risk assessments are costly, so they are unable to conduct them as often as they would like, if at all. Regional and remote councils also face higher costs for data collection due to the cost of road survey vehicles having to travel into remote/distant areas to collect road data. Being risk averse, most local governments are also reluctant to be early adopters of new methodologies, particularly if they are costly.

"Throwing money" at local government was not necessarily the answer however, as even with sufficient funding, they may not have capacity to undertake a risk assessment, or to engage an external consultant. A coordinated approach was suggested, with states/territories (or another organisation) coordinating risk assessments at a regional or state/territory level, rather than expecting each council to organise or undertake their own assessments.

Support for local government

Noting the constraints faced by local government, some interviewees noted the following ways in which their state/territory government or local government associations supported them with road safety work (note: this support was not available for all local governments):

- WALGA developed the LG Stars tool to simplify the risk assessment process for local government. Alongside this tool, WALGA's Road Safety Advisers are helping interested local governments undertake their risk assessments.
- State/territory governments share crash data with local government.
- State/territory governments generally provide guidance for funding applications or treatment selection and review funding applications, if asked.
- Some states/territories deliver road safety capability building workshops, "working bees", webinars, or courses for local governments.
- There is support for some local governments in collecting data for risk assessments, often through trials.
- The Department of Transport and Planning in Victoria provide local governments with an IRR assessment and a Collective Risk rating for corridors and intersections as a starting point for the risk assessment of their network. DTP are also working on other tools to roll out to local government.

The level of support for local government from state/territory governments and local government associations varies across the country. Most local governments appear to work closely with their regional state/territory government offices with most state/territory authorities providing guidance and support if requested. However, some local government interviewees noted they have difficulty getting support from their state/territory government. These comments related to:

- not having clarity on the requirements for funding applications, or the requirements changing,
- a perception of state/territory government staff being unapproachable, and
- assistance being connected to the political nature of projects.

Interviewees also noted the following support received from other organisations:

- External funding is available for road safety work through insurance organisations such as the Royal Automobile Club (RAC) WA in Western Australia, or the Transport Accident Commission (TAC) in Victoria. This funding is often easier to access, as there is a perception of "less bureaucracy" in the approvals process.
- The TAC provides guidance for local governments in Victoria, relating to their funding programs.
- Some interviewees were involved in road safety working groups involving state governments, local governments, police and other interested parties to identify and manage risks.
- Some interviewees also work closely with road safety officers in neighbouring councils and try to support those councils that do not have dedicated road safety officers.

One interviewee noted a concern that other organisations providing guidance to councils, in addition to state/territory governments, could lead to confusion – particularly if their objectives are different to the state/territory or federal government. It was noted that roles and responsibilities should be clear for any framework that is proposed by this project.

Capability and capacity of state and territory governments

The capability and capacity of state and territory governments varies depending on the size of the jurisdiction. For example, states with large urban areas, such as New South Wales or Victoria, may have dedicated teams for different aspects of road safety and asset management, however jurisdictions with a smaller population may only have one or two people who manage the full breadth of their road network. Each state or territory therefore has differing capability to provide support to local governments, on top of obligations for managing their own road network.

A national view of road safety

Some interviewees noted that although the larger states have the capability to make evidence-based decisions for supporting local governments, a national approach would ensure consistency at a national level and would help smaller jurisdictions be more proactive.

It was also noted by local government associations that if local governments are being required to carry out risk assessments (through the Road Safety Action Plan), then they should also be provided with the support and resources to do these assessments. Therefore, a coordinated approach to the technical analysis (e.g. at a state-level) may be more appropriate.

Defining 'fit-for-purpose'

Interviewees commented on the need for any framework to consider the diverse range of capabilities and needs of local government. Some interviewees noted that the "one size fits all" approach is not suitable, and any framework should be scalable. The framework developed in this project should not alienate councils, i.e. only be accessible to well-resourced councils. Many local government transport managers and engineers are not road safety experts and will require support, regardless of what framework or 'tool' is proposed.

The LG Stars tool developed by WALGA, and IRR, were referred to as methodologies that were more suitable for a wide range of local governments. Both require some manual data input which means councils would still need to be able to resource the assessment process. It was also noted that interviewees do not want to reinvent methodologies or unwind work that has already been done.

Some interviewees also emphasised that upskilling local government and providing a framework for assessment may not be sufficient, due to the resourcing issues faced by local government. Therefore, a state or federal approach to the technical analysis may be more appropriate. State governments that have taken a lead on risk assessing networks noted that providing a starting point for local governments is helpful. This could be an initial network assessment using available data, or using a partially automated system that populates road network data for users to review and update if required. This approach has been used in Victoria, where all local governments can view the IRR banding, as well as crash metrics, on a mapping dashboard.

Questions were raised about how 'fit-for-purpose' the Black Spot Program is. Although the Program has historically been effective in reducing casualty crashes, it primarily relies on a reactive (crash-history) approach to identifying high-risk sites. The need for a more proactive approach to funding was raised by several interviewees. Most interviewees were aware that there was already a proactive funding pathway available with the Black Spot Program – but these applications rarely attracted funding due to a prioritisation process that favours sites with a crash history.

Theme 5: Road safety programs and infrastructure funding

If local governments are expected to undertake network road safety risk assessments to prioritise infrastructure investment, then there is naturally an expectation that the assessment should be aligned with funding programs.

The infrastructure (funding) program mentioned the most by local governments was the Black Spot Program, which is administered by state and territory governments. The federal government sets the criteria for the program, and it is administered by state and territory governments. Applicants (state, territory, or local government) can receive up to 100 percent of funding for projects that meet defined criteria. Some state and territory governments have decided to not put forward state road nominations, so that all funding goes to local roads.

Interviewees pointed out that the Black Spot Program historically funded 'reactive' sites where a minimum number of casualty crashes are required at the location. It is also possible to seek funding for 'proactive' sites where crashes may occur in the future, by undertaking a road safety audit to demonstrate the site is a high-risk location. However, some local governments found the process of preparing funding applications onerous, and it was difficult to achieve a benefit-cost ratio (BCR) high enough to meet their state's threshold.

For those that wish to nominate proactive sites, there is additional cost involved in procuring a road safety audit, with no guarantee that the nomination will be successful. This is especially difficult for local governments in growth areas (at the interface between metropolitan and regional areas). These local governments can see potential crash risks emerge as resident and visitor numbers grow and traffic volumes increase, yet they must wait for crashes to occur before addressing 'emerging' high-risk sites. While the split of proactive and reactive projects is flexible depending on local needs, priority would generally be given to locations where crashes have actually occurred.

Some states have other infrastructure programs that local governments can seek funding from for road safety infrastructure projects, but this is not universal. Examples include the Vulnerable Road User Program and Safer Rural Roads Program in Tasmania; the Safer Roads Program in New South Wales, and the Safe Local Roads and Streets Program in Victoria which is funded by the TAC.

Given the common theme of funding and resource constraints among local government, most local governments are unlikely to undertake network risk assessments if there is no funding attached to the outcomes of the assessment. However, it was also noted that tying funding to these assessments alone would be inequitable – as councils who do not have the capability or capacity to do assessments would miss out on funding. One state government did note that this was the direction they are heading in (linking funding to risk assessments), however this approach will have a focus on demonstrating that local governments are moving toward proactively addressing their road safety risks.

Theme 6: Beyond risk assessments

Interviewees were using or intending to use the risk assessments for several purposes, including to:

- understand the baseline systemic risks on their network
- identify high-risk sites and proactively address safety risks before a high trauma crash occurs
- trial different treatments to see their impacts (on the safety rating) and prioritise them for implementation
- re-evaluate risk every five to ten years to see how the safety profile of their network changes
- identify candidate sites for Black Spot Program funding applications
- inform network safety plans
- inform speed management plans
- build the road safety understanding of the public and elected members.

Some caveats that were mentioned in the use of risk assessments included:

- that the assessment alone will not give all the answers
- realistically, it is not possible to have a five-star network (especially in local government)
- it is important to understand the methodology of the assessment to be able to use it effectively.

There was some concern among a couple of interviewees that the risk assessment would simply identify most of their roads as ‘high-risk’ (e.g. 1-Star) using methods like AusRAP, simply because most local government road networks are low-volume, and often extensively unsealed. This needs to be carefully communicated to local government politicians and communities – for example in terms of what a realistic approach is for road safety management of a low-volume ‘1-Star’ road.

Another theme that emerged was around treatment selection. When a network risk assessment identifies high-risk sites, there is an expectation that roading managers or engineers can then select and assess different infrastructure treatment options to address those sites. However, this knowledge is lacking for some local governments, especially knowledge of what treatments are available, the cost of each treatment and expected crash (trauma) reductions. Ideally, guidance on treatment options and treatment selection should be delivered together with guidance on network risk assessment.

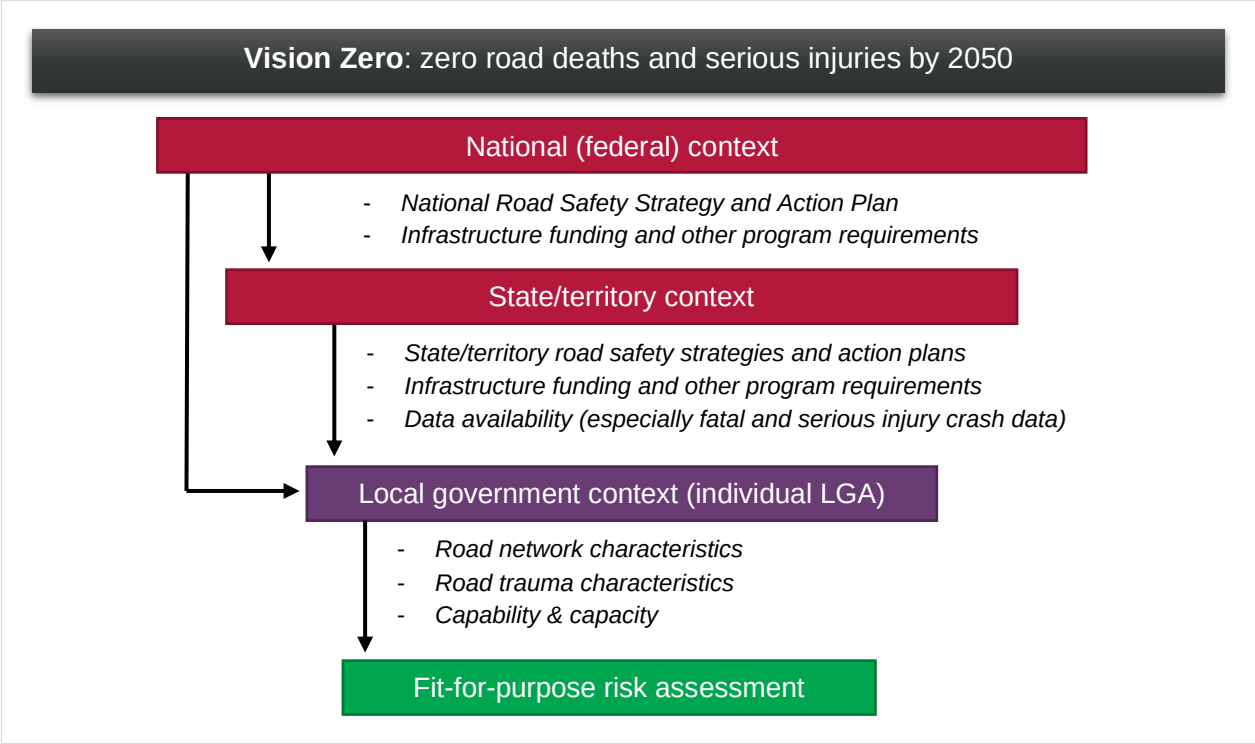
5. Defining 'fit-for-purpose' road safety risk assessment for local governments

This section presents a definition of 'fit-for-purpose' road safety risk assessment for local governments, considering a range of factors.

A simple definition of 'fit-for-purpose' is "*something that does what it is meant to do*[13]". The primary focus for this project is network risk assessments that enable local governments to prioritise infrastructure investment. Therefore a fit-for-purpose road safety risk assessment must provide local governments with sufficient information to determine where such infrastructure investment is required, and the likely scale of investment required.

However, local governments in Australia are highly diverse. They are responsible for roads ranging from major arterials in metropolitan cities, to unsealed roads in the remotest parts of the country. Some councils have large road safety teams – others may have a single engineer or roading manager who performs multiple roles within the council. The scale of trauma across local governments also varies significantly, and so do the infrastructure needs of different councils. Therefore, a 'fit-for-purpose' road safety risk assessment will vary between local governments and depends on many factors, as illustrated in Figure 5.1. These factors are explored in more detail in this section.

Figure 5.1: The interaction of factors that define 'fit-for-purpose' local government risk assessments



5.1 Vision Zero

Figure 5.1 reinforces the national vision of zero deaths and serious injuries by 2050 as the overarching road safety goal for each level of government. The Vision Zero target sets the expectation that all local governments must work towards a road network that eliminates harm to road users.

Over half of all casualty crashes in Australia occur on local roads (Austroads, 2010), however this trauma is not evenly spread across local government areas. Some local governments have much higher levels of FSI than others, while some local governments are virtually 'zero' already. To practically

[13] Sourced from the Cambridge dictionary https://dictionary.cambridge.org/dictionary/english/fit-for-purpose

achieve Vision Zero, those areas with the greatest road safety problem (in terms of total FSI) will need substantially more investment in road safety infrastructure than others. The support and funding for local road safety assessments and infrastructure will be different for each local government – with those with the most FSI requiring greater investment than others.

Where resources are limited, support for local government undertaking a risk assessment must be targeted to where most FSI are occurring or are expected to occur in the future. Prioritisation approaches for supporting local government are discussed further in refer Section 7.2.

5.2 Federal and state/territory requirements

It is foreseeable that, unless otherwise advised, every local government might select a different risk assessment methodology (or combination of methodologies) that is 'fit-for-purpose' for their capabilities and road network characteristics. There is no inherent problem with this approach if the local government has the capability to do the assessment, and it allows them to prioritise road safety infrastructure across their road network. However, the risk with this approach is a lack of consistency in assessments among local governments, which can affect how infrastructure projects are prioritised for funding at a federal or state and territory level. It is desirable, therefore that either the federal government, or state and territory governments, define which fit-for-purpose risk assessment methods should be used for local roads.

For example, the current Black Spot Program Guidelines requires states and territories to rank proactive nominations[14] "*on the basis of a systematic risk assessment or other methodology, provided the chosen methodology is consistent*" (Department of Infrastructure, Transport, Regional Development, Communications and the Arts, 2024, p.13). Additionally for proactive projects on a local government road: *"a recent Network Risk Assessment (produced within the five years preceding the nomination) or Safety Prioritisation Plan, may be used as evidence to support the project nomination*" (ibid, p.10).

In addition to aligning network risk assessments with funding criteria, a consistent approach at a federal, or state/territory level also ensures that:

- consistent support and guidance (e.g., training) can be provided to local governments on specific methodologies (at a federal or state/territory level)
- data to support risk assessments, such as road and/or crash and injury data that are available at a state/territory level, can be provided to local governments in a format that is consistent with the preferred assessment methodology
- risk assessments align with Safety Performance Indicators adopted under road safety strategies at national or state/territory levels.

State and territory governments can consider the factors discussed in this report, as well as the step-by-step guidance provided in Section 6, to decide which types of methods are appropriate for their local governments, and the types of roads they should be applied to.

In Victoria for example, the Department of Transport and Planning (DTP) has assessed every local road using crash-based methods and IRR. Rather than local government undertaking their own network risk assessment, DTP used state-wide crash, injury and roading datasets to automate this assessment for every local road. Their guidance to local governments on how to prepare a Network Safety Plans specifically refers to these methodologies with guidance on how the resulting metrics should be used in the infrastructure prioritisation and planning process.

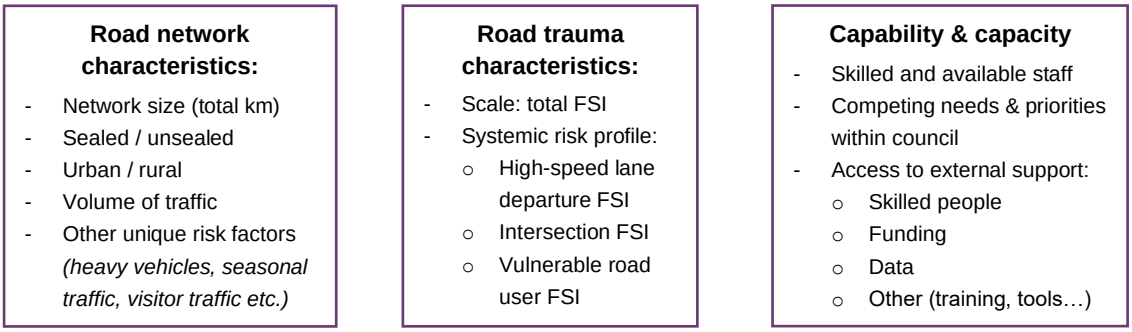
Note that where no preferred approach has been identified by the federal, or state/territory government, then local governments who want to undertake a network risk assessment should follow the guidance provided in this document (refer to Section 6) to identify which assessment methodology (or methodologies) is most fit-for-purpose for their road network and individual needs.

[14] Proactive nominations are sites that do not meet the crash history (reactive) criteria but have been identified as unsafe. These sites are identified using a proactive risk assessment method instead.

5.3 Local government context

At a local government level, selecting a 'fit-for-purpose' risk assessment method involves considering the type of roads that make up the local road network, the type of crashes that occur on those roads including the scale of trauma, and the capability and capacity of the local government to undertake the assessment (Figure 5.2).

Figure 5.2: Defining fit-for-purpose: local context



Road trauma characteristics (systemic risks)

Crash and/or injury data for each local government should be analysed to determine the scale and type of road trauma (FSI) currently occurring on the local road network. At an LGA level, this can be informed by analysing fatal and serious injury crash data to understand the systemic risks on the road network. The analysis should consider the key crash risks (or a similar alternative), as noted in Austroads *Guide to Road Safety Part 2: Safe Roads* (2024) and discussed in Section 2.1:

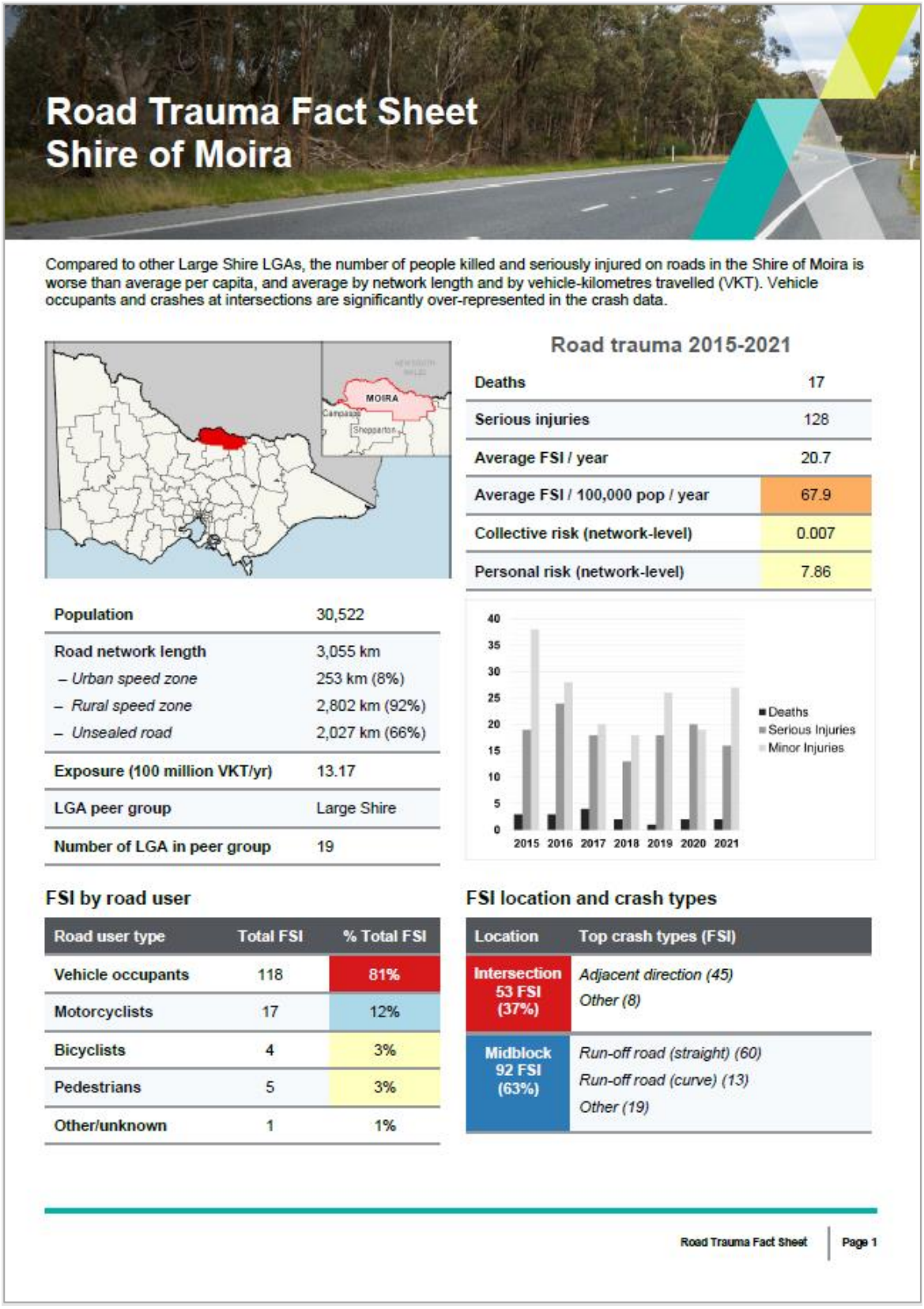
- High-speed lane departure FSI
- Intersection FSI
- Vulnerable Road User FSI

The spread of injuries, particularly FSI, across these three categories should be analysed for each LGA to help determine what type of assessment method (or methods) is most suitable. For example, if most FSI involves high-speed lane departures, then methods that are best at evaluating risk on high-speed rural roads will be most appropriate.

Ideally the assessment of total FSI and systemic risks by LGA is undertaken at a state or territory level. This will help state and territory governments identify where resources to support risk assessments should be targeted.

Some state governments are already providing this level of analysis for local governments in their state. In Victoria, the Department of Transport and Planning (DTP) have produced *Road Trauma Fact Sheets* for all Local Government Areas (LGA). The fact sheets help each LGA understand the composition of road trauma on their network, and how the composition compares to other similar LGA (see example in Figure 5.3). By understanding the key systemic risks on their network, an LGA can then employ a suitable risk assessment process (or processes) and commence the planning and delivery of road safety infrastructure treatments to address these key risks.

Figure 5.3: Example of a local government Road Trauma Fact Sheet (source: Victoria Department of Transport and Planning)



Road Trauma Fact Sheet
Shire of Moira

Compared to other Large Shire LGAs, the number of people killed and seriously injured on roads in the Shire of Moira is worse than average per capita, and average by network length and by vehicle-kilometres travelled (VKT). Vehicle occupants and crashes at intersections are significantly over-represented in the crash data.

Road trauma 2015-2021

Deaths	17
Serious injuries	128
Average FSI / year	20.7
Average FSI / 100,000 pop / year	67.9
Collective risk (network-level)	0.007
Personal risk (network-level)	7.86

Population	30,522
Road network length	3,055 km
– *Urban speed zone*	253 km (8%)
– *Rural speed zone*	2,802 km (92%)
– *Unsealed road*	2,027 km (66%)
Exposure (100 million VKT/yr)	13.17
LGA peer group	Large Shire
Number of LGA in peer group	19

FSI by road user

Road user type	Total FSI	% Total FSI
Vehicle occupants	118	81%
Motorcyclists	17	12%
Bicyclists	4	3%
Pedestrians	5	3%
Other/unknown	1	1%

FSI location and crash types

Location	Top crash types (FSI)
Intersection 53 FSI (37%)	*Adjacent direction (45)* *Other (8)*
Midblock 92 FSI (63%)	*Run-off road (straight) (60)* *Run-off road (curve) (13)* *Other (19)*

Road Trauma Fact Sheet | Page 1

Road network characteristics

The size of the road network, road types, and volume of traffic carried varies considerably by local government. The suitability of risk assessment methods, i.e. their fitness-for-purpose, also varies based on different road network characteristics.

Size of the road network (total km)

In general, the smaller the road network, the easier it is to assess.

For local governments with small road networks (e.g. < 300-400 km of road), risk assessment methods that require manual data input or data collection will be more feasible. These local governments also tend to be urban (e.g. small metropolitan and town councils).

For local governments with large road networks (e.g. > 3,000 km of road), risk assessment methods that are simplified, rely on existing data sources, or could be automated to some degree will be more suitable. These types of local governments tend to be in regional or remote areas and will often have an extensive unsealed road network.

Unsealed roads

Many regional and remote local governments have extensive unsealed road networks, however several of the existing risk assessment methods were not developed with unsealed roads in mind. This includes, for example, a risk scoring approach that results in unsealed roads receiving the same “high risk” or “1-Star” rating, or by not catering for unsealed roads at all.

Unsealed roads are also typically low volume roads with crashes being widely dispersed. Therefore, local governments with predominantly unsealed road networks (e.g. > 50 percent unsealed) should consider a network-wide or systemic risk approach to identifying risks, using a methodology that was specifically developed (or adapted) for unsealed roads.

Road environment (urban/rural)

Urban and rural roads have very different risk profiles. For example:

- There is generally a higher proportion of FSI crashes involving vulnerable road users on urban roads. Crashes tend to be spread across midblock and intersection locations.
- Rural roads generally have a higher proportion of FSI crashes at midblock locations, and crashes are mostly likely to involve vehicle occupants (and motorcyclists).

Because each type of road has a different risk profile, risk assessment methods developed for one type of road may not be applicable for other types of road. For example, wide lanes will improve the safety rating of a rural road but are commonly considered an undesirable safety treatment for urban roads; particularly those with a high ‘place’ function (where narrow lanes are implemented through traffic calming to reduce vehicle speeds).

Local governments with predominantly urban roads should consider risk assessment methods better suited to systemic risks on urban roads, particularly risks to vulnerable road users. Local governments with predominantly rural roads should use risk assessment methods that were primarily developed for use on rural roads.

Developing predictive risk assessment methods that are suitable for urban roads is inherently more complex due to the range and mix of road users, effects of congestion and on-street parking, and the mix of land use activities.

Road environment (midblock/intersection)

An assessment of systemic risks from the crash data will reveal whether most FSI crashes are occurring at midblock locations, at intersections, or across a mix of the two. Road networks where most FSI crashes are at midblock locations are predominantly rural, and often extensively unsealed. Road networks where most FSI crashes occur at intersections are more likely to be urban (with many intersecting roads), or rural networks with higher traffic volumes and/or a grid pattern of intersecting roads.

Most risk assessment methods focus on assessing risk at a midblock level, with some consideration of intersections along each midblock section. Therefore, if a significant proportion of FSI is occurring at intersections, care needs to be applied in selecting risk assessment methods that predominantly assess midblock road attributes or factors, especially when considering infrastructure treatments.

Traffic volume

The amount of traffic carried on local roads varies significantly by local government. In general, at a network level:

- Metropolitan roads will tend to carry relatively higher volumes of traffic.
- Roads on the fringe of metropolitan cities (peri-urban) will also tend to have relatively high volumes of traffic overall (due to commuting, visitor travel, and freight activity).
- Roads in remote and regional areas will generally have lower volumes – except for regional cities with higher volume arterial corridors. Roads in remote areas will tend to have uniformly low volume roads.

Because the likelihood of a crash occurring increases as traffic volume increase, it follows that:

- Crashes are more concentrated (or dense) on high volume road networks. This means reactive risk assessment methods will be more reliable for these road networks, ideally enhanced with predictive risk metrics.
- Crashes are more random (or dispersed) on lower volume road networks. This means reactive risk assessment methods that rely on crash data should be avoided on these networks or only used to supplement predictive risk methods.

Local government capability and capacity

The capability and capacity of local governments to undertake network risk assessments vary across Australia. Feedback from the online survey and interviews indicated that, in general, the more remote a local government is, the less capability they have for undertaking assessments.

The most remote local governments will tend to have a small population, a large road network, and a small roading team (potentially a single engineer). This means they have resource constrained capability and capacity to undertake network-wide risk assessments. A fit-for-purpose approach needs to be simple, and easy to apply. However, these local governments also tend to have relatively few FSI (compared to other local government areas), therefore a simplified approach is also appropriate based on the scale and trauma reduction potential in these areas.

Local governments that are more metropolitan, for example in major cities, were generally perceived as being the most capable. These local government areas tend to have a larger population base, larger roading teams, and smaller road networks (fewer roads to be assessed). This means they are more capable of applying or commissioning more resource-intensive risk assessment methods. These local government areas tend to have higher levels of FSI meaning a more sophisticated approach may be appropriate from a trauma reduction potential perspective.

5.4 Suitability of different assessment methods for different types of road

Section 2 includes a review of the different methods available and identifies the types of roads they are most suitable for. Each method was grouped into one of three tiers:

- **Tier 1:** Basic methods
- **Tier 2:** Intermediate methods
- **Tier 3:** Advanced methods

Table 2.4 in Section 2 highlights the key differences between each tier and identifies which proactive methods match each tier, considering the scale of assessment, data inputs, and predictive capability.

This table is expanded below (Table 5.1), matching the type of assessment to the strategic function of roads. The following principles are considered in this table:

- the scale of the assessment should match the scale of risk (potential FSI), and
- the scale of the assessment should match the scale of potential infrastructure investment.

These principles recognise that those roads with a high strategic function and presenting the greatest risk to road users will typically be those roads where the most costly and transformative treatments will be justified.

Table 5.1: Matching risk assessment methods to road types, using 'strategic function'

Assessment type	Strategic function of road	Typical road classification or M&P category (if not defined by state/territory)	Recommended approach/ methods	Typical type and scale of infrastructure investment
Tier 1: Basic	Low	• Movement function: M4 or M5 (local movement) • M&P category: local streets or city places	LG Stars, or *identify systemic risks from crash data at a network or stereotype level*	• Maintenance, speed management and safety management treatments • Low to very low cost
Tier 2: Intermediate	Moderate	• Functional class: collector • Movement function: M3 (moderate movement of people and/or goods) • M&P category: city streets, activity streets & boulevards	IRR, Austroads stereotypes *Combine with crash metrics, with an equal or higher weighting on proactive risk*	• Supporting treatments[15], including speed management • Low to moderate cost
Tier 3: Advanced	High	• Functional class: arterial or regional • Movement function: M1 or M2 (significant movement of people and/or goods) • M&P category: connectors and city hubs	AusRAP, ANRAM, AiRAP *Combine with reactive (crash-based) metrics*	• Transformational / primary treatments[16] • High cost

[15] Supporting treatment improve the overall level of safety but do not eliminate the potential for high-severity road trauma like transformational / primary treatments.
[16] Transformational / primary treatments are most closely aligned with Safe System outcomes because these treatments are most effective in reducing the potential for high-severity road trauma. This is because they either entirely remove the potential for a serious collision, or they lower kinetic energy transfer to within human tolerances (where the collision potential cannot be eliminated).

The 'strategic function' of the road is used to identify which type of roads fit within each tier of assessment. Actual FSI crash history (e.g. collective risk) should not be used to categorise roads, especially as crash data can be a poor predictor or risk for lower volume roads[17]. Instead, the 'strategic function' of the road, for example as defined in the Movement and Place (M&P) approach, will reflect the future or intended function of each road. The Movement and Place approach in managing road safety is also supported in the *National Road Safety Strategy 2021-30*.

Recognising that there are currently different approaches to classifying roads across states and territories, Table 5.1 also identifies typical categories or classifications that could be used to determine the 'strategic function' of a road. Desirably, each state or territory would develop their own classification schemes to guide local governments in their jurisdiction.

Alternative approaches for assessing intersection and vulnerable road user risk

The risk assessment in Table 5.1 reports on road safety risk at a road segment or corridor level. At present, there are no fit-for-purpose risk assessment methods for local government specifically for assessing intersection risk or vulnerable road user risk at a road network level[18]. For those local governments where the predominant systemic risks are at intersections or involve vulnerable road users, the following risk assessment methods are suggested as interim approaches, until such fit-for-purpose methods are developed.

An alternative approach for assessing FSI risk at intersections

A network risk assessment approach for intersections can be undertaken using crash data with modified FSI equivalents. This approach has been used in Victoria to assess every local road intersection in the state. More information on this approach is provided in Section 2.1.

An alternative approach for assessing FSI risk involving vulnerable road users

Crashes and injuries involving vulnerable road users, particularly pedestrians and cyclists, are widely under-reported in crash databases (Austroads, 2024). Therefore, crash data should not be used for network risk assessments for vulnerable road user risk. Instead, a simple prioritisation approach can be applied to identify locations where:

- there are relatively high volumes of vulnerable road users present, and
- vehicles speeds are relatively high (either speed limits or observed speeds).

Locations with both high VRU activity and high vehicle speeds present the highest risk of FSI involving pedestrians, cyclists or other vulnerable road users. This approach does not specifically provide a 'level of risk' (as in a risk band, or risk metric), but it can be used to prioritise locations for infrastructure treatments that improve safety for vulnerable road users. Some examples of how this approach could be applied include:

- Identifying roads in key activity centres (e.g. shopping malls, town centres) where the speed limit is currently ≥50 km/h and could be lowered. Lower speed limits can be reinforced with traffic calming infrastructure, with this prioritised for roads where observed vehicle speeds are highest.
- For a package of raised pedestrian crossings near schools, prioritise locations that have the most activity (e.g., number of children, intensity of walk/cycle activity) and where vehicle speeds are relatively high – particularly around school drop-off and pick-up hours.

[17] An exception to this would be lower order (low strategic priority) roads with an unexpectedly high crash rate. A more detailed assessment of risk could be appropriate for these types of roads, for example to identify potential risk factors for FSI crashes.
[18] Although there are some risk assessment methods available, they are either not designed for application at a network level, require a high degree of expertise (beyond the capability of local government), or are not suited to lower volume local road environments.

5.5 Summary

To summarise the findings from this section, a concise definition of a fit-for-purpose road safety risk assessment for local government is where:

a) the depth of assessment matches the scale of risk on the road network (potential for fatal and serious injury), and hence the scale of potential infrastructure investment,

b) the assessment is appropriate for the type of roads that make up the local road network, and the predominant systemic risks on those roads, and

c) the requirements for the assessment are within the capability and capacity of the local government to deliver the assessment.

This definition recognises there is no 'one-size-fits-all' approach to local road network risk assessments. It acknowledges that each local council, and each local road network is different.

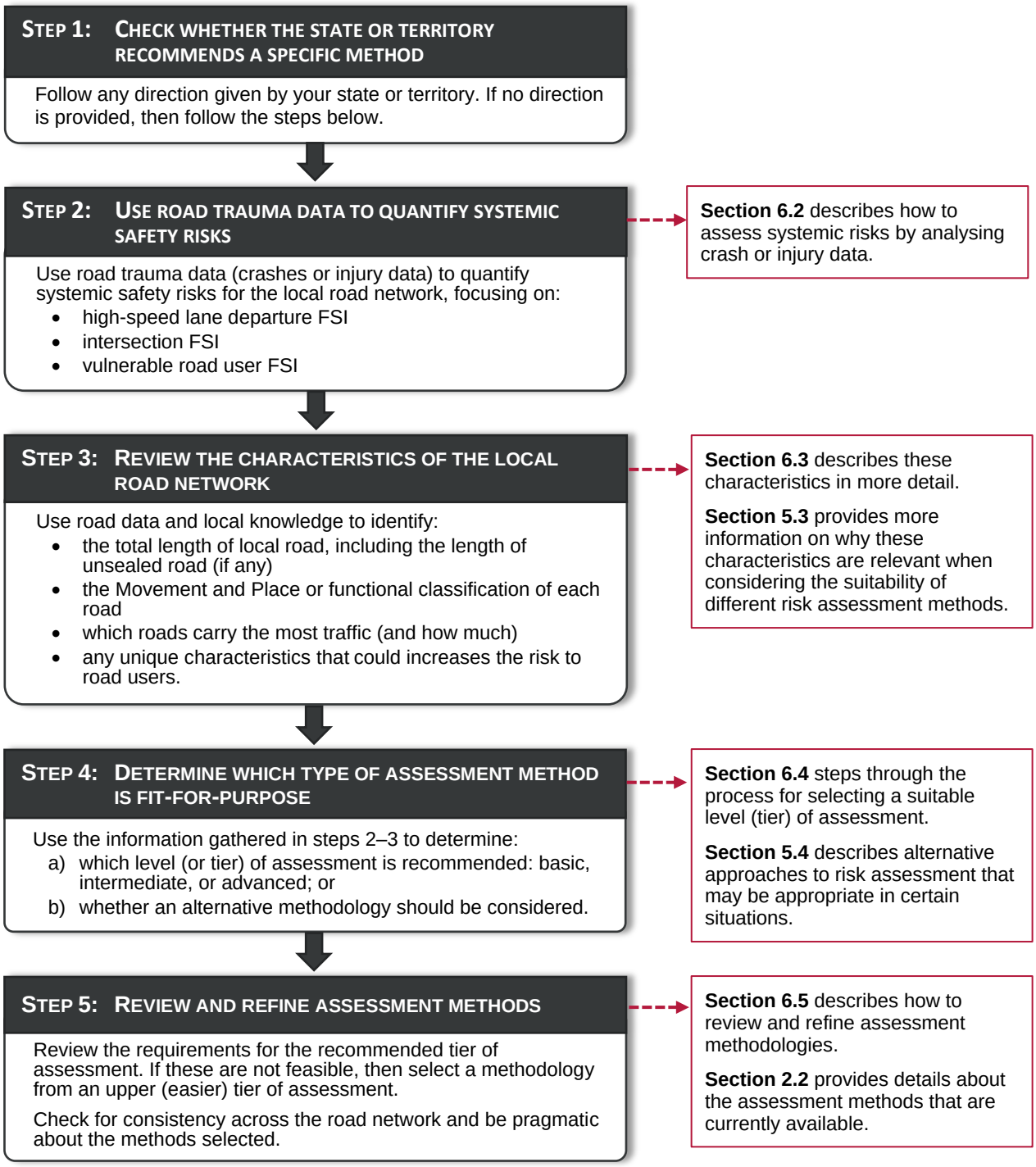
Discounted approaches

One approach that was considered in detail, but subsequently discounted, was to define a 'fit-for-purpose' based on the type of local government area, for example metropolitan, regional city or remote. Whilst defining risk assessment methods as a function of local government type was easy to understand, it failed to capture the variable road network characteristics across different local government areas of the same type. This approach was ultimately deemed too simplistic, based on feedback from those interviewed in the Round 2 interviews.

6. Step-by-step process for selecting a fit-for-purpose risk assessment method

This section sets out a step-by-step process for determining which risk assessment method (or methods) should be used for a particular local government network risk assessment, considering the factors discussed in Section 5. This is summarised in the flow diagram in Figure 6.1.

Figure 6.1: Process for selecting a fit-for-purpose risk assessment



6.1 Step 1: Check whether the state or territory requires or recommends a particular methodology

The state/territory may recommend which risk assessment method(s) should be used for local government roads. The first step should always involve checking if a particular method is recommended or required, particularly in relation to road safety infrastructure project or program funding.

In the absence of any recommended method, local governments should continue to follow the steps below to determine which approach and methods are appropriate.

6.2 Step 2: Assess systemic risks: crash injury data

Road trauma data (crash or injury data) for the local area should be analysed to understand systemic risks on the road network. The analysis should focus on identifying the key crash risks that result in fatal or serious injuries. These will typically be:

- High speed lane departure (head-on, run-off road) FSI
- Intersection FSI
- Vulnerable road user FSI

If the above crash risks do not represent at least 70 percent of all high-severity trauma, then the data should be examined for other key crash risks.

Desirably, information on the systemic risks for local roads, by LGA, should be provided by the state/territory government[19]. This should be based on at least five years of crash data and be supplied in a format that enables local governments to readily understand their systemic risks. Section 5.3 includes an example of how this information could be shared (the DTP's Local Government *Road Trauma Fact Sheets).*

Local governments with a high number or high proportion of intersection or vulnerable road user FSI should consider alternative risk assessment methods, as described in Section 5.4. As a rule of thumb, if either FSI crashes at intersections, or FSI crashes involving VRU make up more than 50 percent of total FSI, it would be considered a 'high proportion' of FSI. However, in making this judgement, it is also important to consider the total scale of FSI in the local government area, and where this FSI is occurring. For example:

- A remote local government has an average of 6 FSI crashes per year, including 3 FSI crashes at intersections. Although 50 percent of FSI are intersection-related, the total FSI is relatively low when considered in a state or national context. Therefore, an intersection specific assessment method is unlikely to be justified.
- A regional local government with a city centre and large rural hinterland has an average of 50 FSI crashes per year, with 15 FSI crashes involving vulnerable road users within the city area. VRUs make up 30 percent of total FSI crashes, but these crashes are concentrated within the city (urban) area. An alternative method for assessing VRU risk should be considered to identify areas at higher risk of VRU crashes within the city.

[19] The National Road Safety Action Plan 2023-25 includes an action for state and territory governments to "Provide local governments with access to serious injury and fatality data for their networks".

6.3 Step 3: Consider road network characteristics

Local governments will need to consider:

- the size (total km) of local road network, including:
  - length of unsealed roads
  - length of urban roads (vs. rural roads).
- the Movement and Place, or other functional classification of the road network
- which roads carry the most traffic, and how much traffic (vehicles per day)
- any unique local factors that affect road safety risk, for example:
  - routes with seasonal traffic fluctuations, e.g. during harvest season
  - routes that carry high volumes of visitor/tourist traffic, like routes to popular holiday destinations
  - routes that carry relatively high volumes of heavy vehicle traffic, for example roads that access quarries or mines
  - locations reported as 'dangerous', for example roads with lots of reported near misses, or locations described by community members as 'accidents waiting to happen'.

Much of this information can be sourced from existing GIS datasets, road asset management sources, or through local knowledge.

6.4 Step 4: Determine appropriate 'fit-for-purpose' risk assessment method(s)

Use the guidance in Section 5.4 to identify what tier of assessment is best suited for each type of road, or road stereotype. This might include a mix of:

- **Tier 1:** Basic methods
- **Tier 2:** Intermediate methods
- **Tier 3:** Advanced methods.

6.5 Step 5: Review and refine assessment methods

Section 2.2 describes each risk assessment method in more detail, including data requirements, assessment requirements, and where to find more information. This information will help local governments identify which methods are most suitable for their road network.

If the level of analysis (tier) indicated in Step 4 is not feasible, for example due to a lack of funding, data, or capability to complete the assessment – then it is acceptable to select the method(s) from an upper tier. This is a pragmatic approach that recognises not all local governments have the capability or capacity for more advanced assessment methods – and this should not act as a barrier that prevents an assessment from being undertaken.

Ideally there should be no more than two assessment methods applied across a single road network. If the flow chart suggests three different tiers of assessment are required, consider which types of assessment are most appropriate (for each type of road) and apply those.

Check for consistency across the road network and be pragmatic about the assessment approach selected. For example, if most of the network is 'Tier 1' but with a small amount of 'Tier 2' roads, then it may be pragmatic to simply apply the Tier 1 approach to all roads. Also be aware that functional classifications or Movement and Place categories could be incorrect.

Finally, consider how the classification of roads may change in the future – especially peri-urban roads where traffic growth or urban development is expected over the next five to ten years. In this example, a higher degree of assessment may be appropriate.

7. Frameworks for supporting local government develop risk assessments

This section considers different frameworks which the Australian Government, state/territory governments and/or local government associations can use to support local governments develop risk assessments. Note that for brevity in the section that follows, these organisations are collectively referred to as 'umbrella' organisations.

7.1 Support frameworks – options

Three broad frameworks for providing support for risk assessments have been identified:

1. **Local government-led**: where umbrella organisation(s) provide support such as funding, training, and other guidance, but it is ultimately up to the local government to lead the assessments.
2. **State/territory-led**: where the state or territory coordinates or undertakes assessments on behalf of local governments.
3. **Co-design approach**: where an umbrella organisation and local governments work together to deliver risk assessments and develop infrastructure programs/projects.

Each framework has pros and cons, and these are explored in the sections below. Note that the approaches developed or currently provided by umbrella organisations could involve a mix of frameworks, and the lines between each option are not clear-cut.

As noted earlier, it is also important to recognise that 'risk assessment' is only one part of the broader process for delivering safer road infrastructure on local roads. Therefore, each option has also been assessed on the degree to which the support for a local government is enduring, including beyond the risk assessment stage – for example, help with identifying suitable treatment options, as well as assistance with project prioritisation, funding, and delivery of infrastructure that improves safety outcomes.

Local government-led assessments

In this option, each local government leads their own assessments – with some external support provided by an umbrella organisation. This support could take many forms, including:

- Providing skilled resources, e.g. regional coordinators that help local government to deliver road risk assessments as required or requested.
- Developing local government specific guidance and training, which may include tools and templates to assist with undertaking assessments. This could be developed by the umbrella organisation or contracted out to an external party.
- Providing direct funding or grants for local government to undertake or commission assessments. The funding could be the same for each local government (e.g., a fixed amount per area), or targeted (e.g. commensurate to the scale of FSI per local government area).
- Providing access to data (not otherwise available) to assist local government with their assessments.

Example: WALGA RoadWise and LG Stars

To support local governments to undertake assessments with LG Stars in Western Australia, WALGA developed an assessment guide, an online tool, and delivered training. Regional advisors employed by WALGA provide dedicated support (days per month) to work directly with LGAs undertaking their assessments.

State or territory-led assessments

In this option, the umbrella organisation commissions or undertakes assessments of local roads, on behalf of the local government. The local government receives the outputs of these assessments in a form they can readily use to develop road safety infrastructure programs. This option typically involves:

- using internal staff or external consultants to coordinate data collection and undertake assessments of local roads
- undertaking automated risk assessments (e.g. running IRR assessments using existing datasets)
- delivering the risk assessment outputs in an easy-to-use format (e.g. spreadsheets, or web maps)
- providing supporting resources to the local government, including training on how to use the assessments.

Example: Victoria's IRR risk assessment of local roads

In Victoria, the Department of Transport and Planning undertook a risk assessment of every local government road in the state, including:

- Undertaking a crash-based assessment (with crash data modified with FSI casualty equivalents) to map collective risk for all road corridors and intersections.
- Mapping IRR for every local road, using an automated methodology and road-related datasets.

This information is shared in a PowerBI dashboard application that includes a mapping component, which allows each LGA to understand the distribution of risk across their network, and to filter and query road risk data for their local area.

Co-design approach to assessments

In this option, the umbrella organisation and local government(s) work together in partnership to deliver risk assessments, and potentially to plan and deliver infrastructure improvements. This approach is best delivered as part of a broader support program for local government, where the co-design process extends beyond the risk assessment and includes support for infrastructure planning and delivery.

Example: Safer Local Road and Streets Program Victoria

The Transport Accident Commission (TAC), in partnership with DTP, developed the Safe Local Roads and Streets program to support the development and delivery of road safety infrastructure projects on local roads. The intention is to work alongside all Victorian local governments to plan, design and deliver $200 million of safety improvements on the highest risk local roads, intersections, and precincts. The program includes engaging in a collaborative workshop process with each local government to assess and analyse road safety risk on their road network and inform a list of prioritised projects for potential funding. This program expands on the local road IRR assessment delivered by DTP (as described in the previous example), by working with local councils to review the IRR assessment and development treatment options.

Example: Speed and Infrastructure Programme NZ (Local Roads Team)

A similar approach was adopted in New Zealand, where a local roads team was formed within the NZ Transport Agency to support the delivery of the government's Speed and Infrastructure Programme. The team was comprised of several regional co-ordinators who held workshops with local authorities to identify high risk locations and identify potential speed and infrastructure projects. The workshops aligned with the three-year National Land Transport Planning horizon, ensuring each local government put forward suitable projects for prioritisation and funding. Tools were developed to support the co-design processing including the "Pipeline Development Tool" that identified high-risk sites for each local authority and enabled the efficacy of different treatment options to be tested before being submitted for review (and potentially funding).

One of the benefits of this approach is it allows local authorities to input local knowledge into the risk assessment and infrastructure development process, for example by identifying sites where residents had raised safety concerns or where road safety improvements could be delivered alongside other council programs (e.g. walking and cycling programs or reseal projects).

Comparison of options

Table 7.1 compares the benefits and limitations of each framework.

Table 7.1: Comparison of different frameworks for supporting local government risk assessments

Factor	Supporting Local Government-led assessments	State/territory-led assessments	Co-design approach
Provides enduring support to local government?	Potentially	Potentially	Potentially
Effort required from umbrella organisation	Low	Moderate	High
Effort required from each LGA	High	Low	Moderate
Meets the needs of different LGA?	Potentially, depending on the level of support provided	To some degree	Yes
Efficiency of delivery (of risk assessments)	Poor-moderate depending on the type of support provided	Good, due to economies of scale	Moderate
Develops local govt road safety knowledge/expertise	Yes – but only for those LGA that undertake assessments.	Moderate, depending on what additional support or degree of engagement is provided	Yes
Provides support beyond risk assessments	Potentially, depending on the level of support provided	Potentially, depending on the level of support provided	Yes
Rate at which assessments are undertaken (e.g. km network assessed over time)	Low-moderate, depending on the type of support provided	High	Moderate – should achieve good network coverage, but this takes time due to the collaborative approach

This comparison shows that no approach is perfect; however, the state/territory-led and co-design approaches are assessed to be more fit-for-purpose than the local government-led approach. The co-design approach delivers the most benefits but requires the most effort from the umbrella organisation to coordinate. The state-territory-led approach has many benefits, including the cost-effective delivery of risk assessments and the rate at which assessments can be delivered. There is a risk, however, that because the assessment is done for local government, that local government are less engaged in the risk assessment and infrastructure planning process than they would be in the other options.

7.2 Prioritising support for local government

Acknowledging that the state/territory governments and local government associations have limited resources and expertise to support local government – it is sensible to focus efforts on where this support will achieve the greatest benefit (in terms of road trauma reduction).

Where resources are limited, the effort in undertaking a risk assessment must be targeted to where the greatest risks and FSI exist, either at present or expected in the future. This approach is confirmed in the National Road Safety Action Plan 2023-25, which requires state and territory governments to prioritise safety risk assessments on high to moderate volume regional and remote roads (state and territory governments).

One approach to identify where the greatest risks are, at a broad level, is to assess local governments at state/territory or federal level, ranking each local government by road trauma levels (e.g. total FSI), using crash or other injury data sources.

Options for prioritising support include:

- target local government areas where most of the FSI or casualty crashes are occurring (at a state or national level)
- target local government areas that have the least capability or capacity to undertake risk assessment
- target local roads by strategic function (irrespective of the local government area)
- target local roads that are among the top 10 percent highest risk roads, based on a reactive analysis of crash data (irrespective of the local government area)
- targeting those local governments that are self-nominated (e.g., those that are interested but have limited capability or capacity to do assessments themselves).

The prioritisation of resources could be applied to any of the support frameworks identified. Table 7.2 provides examples of how each approach could be applied to deliver targeted support for local governments.

Table 7.2: Approaches and examples of how support for local government risk assessments could be prioritised

Prioritisation approach	Example application(s)
Prioritise those local government areas that have the most road trauma (FSI)	• Provide targeted support for risk assessments of those local government areas where most of the road trauma is occurring (e.g., top 20 percent of local government areas). • Create a grant program to fund risk assessments for local government areas that meet a threshold for total for FSI, e.g., > 100 FSI per year (across a state/territory, or nationally)
Prioritise those local government areas that have the least capability or capacity	• Fund and build a team of road safety regional coordinators to travel to, and work with local governments developing risk assessments in regional areas. • Commission a consultant to deliver on-site risk assessment training in remote and regional areas.
Target roads where most of the FSI is occurring	• Fund and/or coordinate Tier 3 AusRAP assessments for local roads with a high traffic volume, of a high strategic function under a movement and place framework (e.g. all rural connectors)
Local governments are self-nominated	• Issue an Expression of Interest for local government to self-nominate their interest in engaging in a co-design process.

8. Conclusion and recommendations

The purpose of this project was to support the delivery of the *Road Safety Action Plan*, specifically the action on the Australian Government to:

> *Lead the development of a framework in consultation with all governments, to support local governments to conduct fit-for-purpose network road safety risk assessments to prioritise infrastructure investment.*

This project involved conducting research and working closely with local governments, state and territory governments, and local government associations, to address the following objectives:

1. Identify and review the different road safety assessment methodologies currently used in Australia by state/territory and local governments to provide a baseline from which to measure progress against the Road Safety Strategy 2021-30 and its Action Plan.
2. Recommend a methodology-neutral definition of 'fit-for-purpose' road safety risk assessment to be used by local governments which considers both state/territory and local government requirements.
3. Identify the skills, capabilities and support local governments require to develop 'fit-for-purpose' risk assessments.
4. Provide options for different frameworks which the Australian Government, state/territory governments and/or local government associations can use to support local governments develop risk assessments, as well as broader road safety capability building.

8.1 Objective 1: Road safety assessment methodologies currently used in Australia

The road safety assessment methodologies currently used in Australia were identified and reviewed in Section 2. The focus of this review was on methodologies that are currently used for network risk assessments.

A network risk assessment is undertaken across all or part of a road network. It involves:

- using information about the road environment or crash data to determine the current (or projected) safety risk to road users at corridors and/or intersections, and
- applying this methodology across the network to identify those sites at highest risk of a fatal or serious injury crash in the future.

"High risk" sites are defined either by their risk relative to other locations, or by comparing them to an established risk threshold like a Star Rating or a specified crash density/crash rate metric. The objective is to ensure that locations with an established or emerging safety issues are prioritised for road safety infrastructure treatments ahead of lower risk locations.

The review of risk assessment methodologies also:

- identified existing best practice in risk assessment (section 2.1)
- identified where people can find more information or resources for each methodology (section 2.2)
- compared the operational requirements of each methodology, and their suitability for different road environments (section 2.4)
- developed an approach for categorising risk assessment methodologies – using three tiers from 'basic' to 'advanced' (section 2.5)
- described the relative merits of proactive and reactive risk assessments, and how the two approaches can be combined (section 2.6).

The extent to which these methods are being used by local governments was examined in the local government survey, as discussed in Section 3.

The survey was advertised widely across many channels and had an effective response rate of 21.3 percent. Most (57 percent) local governments surveyed stated that had not undertaken a risk assessment in the past 12 months or were unsure if they had undertaken this assessment. Those local governments that had completed risk assessments predominantly used crash-based methods, and most respondents had assessed a relatively small portion of their network (< 20 percent). The full results from the survey are presented in Section 3.3.

8.2 Objective 2: A methodology-neutral definition of 'fit-for-purpose' road safety risk assessment that can be used by local governments

A definition of 'fit-for-purpose' road safety risk assessment for local governments was developed considering feedback received in the local government survey and stakeholder interviews.

Section 5 describes the factors that were considered in developing this definition, recognising the wide range of local governments and local road networks across Australia. A concise definition of a "fit-for-purpose road safety risk assessment for local government" is where:

a) the depth of assessment matches the scale of risk on the road network (potential FSI), and hence the scale of potential infrastructure investment.

b) the assessment is appropriate for the type of roads that make up the local road network, and the predominant systemic risks on those roads, and

c) the requirements for the assessment are within the capability and capacity of the local government to deliver the assessment.

An important consideration in defining 'fit-for-purpose' is ensuring the risk assessment methodology is a good 'fit' for the type of roads and systemic trauma risks on the local road network. For example, a methodology that was developed for assessing risk on high-speed rural roads could have a poor 'fit' for assessing risk on road networks that are predominantly urban.

When considering the range of local road networks across Australia, it was also observed there are no 'fit-for-purpose' risk assessment methods that were specifically developed to assess intersection risk or vulnerable road user risk, at a network level. Section 5.4 identifies alternative approaches to assessing these risks for local road networks where the predominant systemic risks are at intersections or involve vulnerable road users. These are suggested interim approaches, until such fit-for-purpose methods are developed.

Section 6 presents a simplified, step-by-step process for determining which risk assessment method (or methods) should be used for a particular local government network, considering the definition developed in Section 5.

8.3 Objective 3: The skills, capabilities and support local governments require to develop 'fit-for-purpose' risk assessments

The skills, capabilities and support local governments require to develop 'fit-for-purpose' risk assessment were identified through survey and interviews. The relevant findings from these are summarised in Section 3.3 and Section 4.2 respectively.

When survey respondents were asked to comment on what support they needed for risk assessments (either to start doing them, or to expand the length of the network assessed), the key themes provided were:

- funding or assistance with costs, including funding for external assessments; and
- resourcing (more staff, or access to skilled and trained staff).

In the interviews every local government interviewee commented on the lack of time and having other priorities as factors that make undertaking risk assessments difficult. The skills and knowledge held by local governments is also highly affected by turnover in staff.

8.4 Objective 4: Options for different frameworks to support local governments develop risk assessments

Section 7 presents three options for frameworks that the Australian Government, state/territory governments and/or local government associations can apply to support local governments develop risk assessments:

- **Local government-led**: where umbrella organisation(s) provide support such as funding, training, and other guidance, but it is ultimately up to the local government to lead the assessments.
- **State/territory-led**: where the state or territory coordinates or undertakes assessments on behalf of local governments.
- **A co-design approach**: where an umbrella organisation and local governments work together to deliver risk assessments and develop infrastructure programs/projects.

Each framework has pros and cons, and these are explored in this section. Note that the approaches developed or currently provided by umbrella organisations could involve a mix of frameworks, and the lines between each option are not clear-cut.

This section also identifies options how support and resources for local government can be prioritised.

8.5 Recommendations

Several recommendations to further support local governments and to address gaps in risk assessment methodologies were identified in this report:

1. It is desirable that state and territory governments define which fit-for-purpose risk assessment methods should be used for local roads in their area. Ideally, the method(s) should align with the requirements of any funding program and consider the Movement and Place framework or functional classifications of local roads.
2. Further investigation into the suitability of the nationwide adoption of the LG Stars methodology is recommended, considering any learnings or limitations from recent applications in Western Australia.
3. Investment is needed to develop fit-for-purpose risk assessment methodologies for urban roads (focusing on VRU risk), and intersections in local government areas.

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Appendix A. Local government survey

A1. Survey distribution

The survey was delivered via SurveyMonkey and was open between 15 April 2024 and 10 May 2024. It was promoted to local governments using the following channels:

- Email distribution campaign:
  - 15/04/24: survey distributed to all local councils via a Mailchimp campaign. Contact emails were sourced from the Australasian Local Government Association (ALGA) and ACRS memberships.
  - 30/04/24: survey reminder sent via direct email to all councils yet to complete survey.
  - 08/05/24: survey reminder sent via direct email to all councils yet to complete survey.
- ACRS Weekly Alerts (email newsletter campaign):
  - Survey advertisement appeared in Weekly Alert (18/04/24, 24/04/24, 02/05/24, 09/05/24).
- Word-of-mouth
  - Interviewees from the first round of interviews (33 interviewees over 25 interviews) from local governments , state/territory governments and local government associations were alerted to the survey and encouraged to complete and/or share through their networks.
  - Survey was presented at the ACRS LGN April Deep Dive: Speed Management for Safety (10/04/24). Attendees (66) were encouraged to complete and share through their networks.
- Promotion through other organisations
  - 15/04/2024 - ALGA promoted the survey in dedicated news article on the ALGA website.

A2. Survey questions

Intro Page 1

Title text: Local Government Network Risk Assessment Project Survey

Description text: The Office of Road Safety is interested in how local governments in Australia can be better supported to undertake network safety risk assessments. We are seeking feedback from all local governments in Australia. Even if your council is not currently doing network risk assessments – we want your feedback.

About this survey

This survey is part of a broader project which aims to identify best practice for network risk assessments that are fit-for-purpose and applicable across diverse areas, from urban centres to rural and remote regions.

Your feedback in this survey will help identify the skills, support and capabilities local governments need to undertake fit-for-purpose network risk assessments. We are interested in the barriers and challenges facing local government, as well as examples of good practice in network risk assessment. The results from this survey will also be used as a baseline to measure progress against the National Road Safety Strategy 2023-30.

This project is being managed by the Australasian College of Road Safety, on behalf of the Office of Road Safety. If you have any questions or comments about this project, please contact Caroline Colbran: caroline.colbran@acrs.org.au.

What is a network risk assessment?

A network risk assessment is undertaken across a road network. It involves:

- using information about the road environment or crash data to determine the current (or projected) safety risk to road users at corridors and/or intersections, and
- applying this methodology across the network to identify those sites at highest risk of a fatal or serious injury crash in the future.

“High risk” sites are defined either by their risk relative to other locations, or by comparing them to an established risk threshold like a star rating or a specified crash density/crash rate metric.

The objective of the network risk assessment approach is to ensure that locations with an established or emerging safety issue are prioritised for road safety infrastructure treatments ahead of lower risk locations.

Network risk assessments form a critical component of network safety planning process. The National Road Safety Action Plan 2023-25 defines a 'Network Safety Plan' as "… an assessment of the road safety risk across a road network supplemented by the assessment of benefits against the costs of specific road safety interventions to reduce that risk. The output of a network safety plan is an investment plan which can be budgeted for and implemented as funds become available."

Click button: **[next]**

Intro Page 2

Title text: Privacy Statement and Participant Information and Consent Statement

Description text: By completing this survey, you are agreeing to participate in the Local Government Network Risk Assessment Frameworks project, conducted by ACRS and Ableyand are confirming:

- You have received and read the information provided about the project.
- You understand the general purposes, risks, and methods of the research.
- You have had the opportunity to ask questions.
- You consent to participate in the research project and understand what you are required to do.
- You understand that your participation is voluntary.
- Who you should contact for any complaints or questions regarding the project.
- The security and confidentiality of your personal information (see below).
- You retain the right to withdraw from the study at any time.
- That the results from this study will be published and your identity will not be revealed.

Privacy Statement

All the information you provide when participating in this survey will be kept confidential. No potentially identifying details or findings will be published. No names will be included in any research records. All data collected will be held by the Australasian College of Road Safety until the end of the project upon which time it will be destroyed. Only researchers involved in this project will have access to this data. The results from this survey will be aggregated and reported to the Department of Infrastructure, Transport, Regional Development, Communications and the Arts. The findings from this survey (and across the wider research project will also be presented at the 2024 Australasian Road Safety Conference. All feedback received in this survey is confidential. All findings will be anonymised and aggregated in output reports.

Click button: **[next]**

Next page

About your local government area

- Your role - optional
- Local government area – (free-text)
- State (tick box option):
  - New South Wales
  - Northern Territory
  - Queensland
  - South Australia
  - Tasmania
  - Victoria
  - Western Australia
  - Australian Capital Territory

Please select the description that best describes your local government area:

- Metropolitan
- Metropolitan fringe/peri-urban
- Regional town/city
- Large rural shire/council (population >5,000)
- Small rural shire/council (population >5,000)
- Other/unsure (please describe in the comments below)

[optional text box included]

Next page

[Intro text] A network risk assessment involves using crash data or other information about the road environment to determine the current (or projected) safety risk to road users across a road network.

There are many different methodologies that can be used for network risk assessments, including:

- crash-based methods, for example identifying blackspots or crash clusters along corridors or at intersections, calculating collective risk (crash density) and personal risk (crash rate) metrics, or using tools like ANRAM.
- infrastructure-based methods, such as AusRAP, Infrastructure Risk Rating, and WALGA RoadWise 'LG Stars'.

Question 1: To the best of your knowledge in the past 12 months, has a network risk assessment been undertaken for some (or all) of the roads controlled by your council?

- Yes
- No
- Unsure

[at this point the survey branches, depending on the answer given]

Next page

[IF Question 1 = "**Yes**", then direct survey to the following questions]

Question: In the past 12 months, approximately how much of your road network was risk assessed?

- 0-20%
- 21-40%
- 41-60%
- 61-80%
- 81-100%
- Unsure
- Other (EG. Just crash locations assessed)

[optional text box included]

Question: Who undertook this assessment? Select as many as relevant:

- Council employee(s)
- Consultant(s) engaged by the council
- Our state or territory government
- Other (please explain below)

[optional text box included]

Question: Were any of the following methods used in the network risk assessment? Select as many as relevant:

- Using crash data (for example to calculate crash density/crash rate at different locations)
- AusRAP
- Austroads: Network Roadside Risk Intervention Threshold (NRRIT)
- Austroads: Stereotypes for Cross-sections and Intersections
- ANRAM
- Infrastructure Risk Rating (IRR)
- iRAP ViDA
- WALGA LG STARS (Safety Ratings Tool for Local Government Roads)
- If you used a different network risk assessment method (or methods), please describe this below:

[optional text box included]

Question: How have you used the outputs from the network risk assessment? Select as many as relevant:

- To determine appropriate infrastructure treatments for high-risk sites
- To prioritise infrastructure investment
- To develop a program or pipeline of road safety infrastructure treatments
- To support a funding application
- To assist with speed management / speed limit setting
- We have not used the outputs from the network risk assessment
- Other (please describe in the comments below)

[optional text box included]

Question: Please describe what support or guidance you used to help with your assessment. (EG. Used state supplied data/information, employed a consultant, followed the WALGA LG Stars methodology etc.): [optional text box included]

Question: We are interested in the challenges facing local councils who are undertaking network risk assessments. Please rate the degree to which you agree with each of the following statements:

[rating scale 1 to 5, where 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree, plus tick box for 'unsure/not relevant']

- I have a good understanding of what a 'network road safety risk assessment' is.
- I understand how network risk assessments are used in road safety planning.
- I have access to resources on how to undertake network risk assessments.
- Our council has access to the necessary data required to undertake a network risk assessment.
- Our council has sufficient budget or resources (people) to undertake a network risk assessment.
- We have support from our state/territory government for network risk assessments (e.g. guidance, dedicated resources, dashboards etc).

Question: In your opinion, what do you need to improve or expand your network risk assessment(s)? [optional text box]

Question: Do you have any further comments about local government network risk assessments? [optional text box]

Question: We are looking for case studies from councils who have undertaken network risk assessments or have used network risk assessments to develop infrastructure programs or network safety plans. If you have an example you would like to share with us, we would like to hear from you.

[Optional opt-in tick box] "Yes, I have a project or application that should be considered for a case study".

[Optional fields: name and email address]

Next page

[IF Question 1 = "**No**" or "**Unsure**" then direct survey to the following questions]

Question: If you selected 'Unsure' in the last question, please describe why you are unsure: [optional text box]

Question: There are several methods that can be used to undertake a network risk assessment. Please rate your familiarity with the following risk assessment method:

[rating scale 1 to 4, where 1 = not at all familiar, 2 = slightly familiar, 3 = somewhat familiar, 4 = very familiar, plus tick box for 'unsure/not relevant']

- Using crash data to assess road safety risk, for example comparing crash counts or crash rates at different locations
- AusRAP
- Austroads: Network Roadside Risk Intervention Threshold (NRRIT)
- Austroads: Stereotypes for Cross-sections and Intersections
- ANRAM
- Infrastructure Risk Rating (IRR)
- iRAP ViDA
- WALGA LG STARS (Safety Ratings Tool for Local Government Roads)

Question: Are you aware of any specific resources (guidance, training, tools, dashboards etc) that are available to assist with you or your council with network risk assessments? Please describe these below. [optional text box provided]

Question: We are interested in the challenges that stop local councils from undertaking network risk assessments. Please rate the degree to which you agree with each of the following statements:

[rating scale 1 to 5, where 1 = strongly disagree, 2 = disagree, 3 = neither agree or disagree, 4 = agree, 5 = strongly agree, plus tick box for 'unsure/not relevant']

- I have a good understanding of what a 'network road safety risk assessment' is.
- I understand how network risk assessments are used in road safety planning.
- I have access to resources on how to undertake network risk assessments.
- Our council has access to the necessary data required to undertake a network risk assessment.
- Our council has sufficient budget or resources (people) to undertake a network risk assessment.
- We are not required to undertake a network risk assessment or didn't know we should be doing this assessment.
- We have support from our state/territory government for network risk assessments (e.g. guidance, dedicated resources, dashboards etc).

Question: What resources or support would be most useful to help you or your council with network risk assessments? [optional text box included]

Question: Do you have any further comments about local government network risk assessments?

[optional text box included]

Final page

Thank you for taking time to provide feedback.

If you are interested in receiving updates about this project, please provide your details below:

- Name (optional)
- Email address (optional)

Appendix B. Interview question prompts (Round 1)

B1. State/territory governments

Interview focus:

- To better understand network risk assessment practices for state roads
- To understand if (and how) state/territories support local government with network risk assessments

Question prompts:

State road network risk assessments

- Are you doing network risk assessments on state/territory roads (yes/no/unsure)
- What network risk assessment method(s) do you use for state/territory roads? Explore:
  - What roads are assessed? (note: we will need to draw out % of network in some form, potentially in a follow-up question)
  - Who does the assessment?
  - How often the assessments are done?
  - How do you see assessments changing over time?
- What guidance do you use in your assessments? (Explore existing resources and are they good/bad etc)
- How do you use the network risk assessments? (e.g., speed management, infrastructure planning etc) – dig into practical examples where possible
- How do you rate your capability/skill in undertaking network risk assessments (explore skill, resource, capability gaps). Can you identify the top 'gap' that needs to be addressed?
- Are there any other gaps or things you need support with (eg data?)
- What does a 'fit-for-purpose' mean network risk assessment look like?
- If no or limited assessments are done:
  - How do you identify high risk roads and intersections?
  - How do you plan road safety treatments/interventions?
  - Are you familiar with different network assessment techniques (elicit examples)
  - Are you planning on doing assessments in the future?
  - What do you need to do these assessments? Explore capability, resources, skills guidance etc
  - Anything else?

Supporting local government network risk assessments

- Describe state/territory funding programs for local road safety infrastructure (let's find out more about how local govt road safety projects are funded by the state).
  - What risk assessments do local governments need provide in their funding applications? Examples?
  - Is the risk assessment process likely to change in the future? How? (thinking about how this sits within the network safety planning approach)
- Do you support local councils with network risk assessment on local roads?
  - If so, how do you support them? (e.g. data, guidance, training, doing the assessment for the etc.)
  - If not:
    - Where do local governments get this support from?
    - Do you intend to support LG in the future (and how?)
- Are you aware of any local road case studies of doing/using network risk assessment? If yes – what council, and do you have contact details (in case we should follow-up later).

B2. Local government associations

Interview focus:

- To explore how LGAs are supporting local governments with network risk assessments, if at all.
- To identify challenges/gaps/concerns raised by local councils in undertaking risk assessments
- To identify the skills, capabilities and support local governments to develop “fit-for-purpose” risk assessments.

Question prompts

- Tell us about your organisation - and what the LGA does to support road safety in local government
- Are you familiar with the National Road Safety Strategy and Action Plan? (and further: are you familiar with where the strategy is headed with network risk assessments and network safety planning)
- Do you know if your councils are doing network risk assessments?
  - If yes – explore the type of assessments, why they are doing them, what councils are doing them etc. Are you aware of any good examples of how those assessments are used?
- How do councils identify ‘high risk’ roads?
- How do councils identify where to invest in road safety treatment (infrastructure and speed?) How do they get funding for these treatments?
- Are you aware of any specific network risk assessment methods/techniques? (see what they are familiar with).
- Are you aware of any guidance or other support available for local governments undertaking network risk assessments?
- What are the challenges faced by local government in doing network risk assessments (explore skill, resource, capability gaps). Can you identify a top ‘gap’ that needs to be addressed?
- Aer you aware of any guidance or other support available for local governments undertaking network risk assessments?
- Is there anything else you think is relevant to this project or things we should be aware of?

B3. Local governments

Interview focus:

- To explore how different local governments assess road safety risk, and how these assessments are used for infrastructure planning.
- To understand how they are being supported (or not) in undertaking network risk assessments.
- To explore the skills, capability, resourcing, and other challenges for local government in doing these assessments.

Question prompts:

About the council

- Tell us about your council/shire:
  - Size, type of council area (regional, remote, metro etc, types of road network, general population profile)
- Tell us about your road network (types of roads, length of network etc)
- Tell us about your road safety trauma/trends (eg rural roads, pedestrians, motorcyclists, road user behaviour…)
- Tell us about your capability in road safety (particularly road safety officers, road safety manager, number of staff/size of team involved)

Network risk assessments

- Are you familiar with the National Road Safety Strategy and Action Plan? (and further: are you familiar with where the strategy is headed with network risk assessments and network safety planning)
- Are you doing network risk assessments on local roads (yes/no/unsure) If yes, explore:
  - What method(s) do you use?
  - What types of roads are assessed?
  - Who does the assessment?
  - How often the assessments are done?
  - How do you see assessments changing over time?
  - Could we talk about your experience in a case study? (if relevant)
- What guidance or support do you use in doing your assessments? (Explore existing resources and usefulness)
- How do you use the network risk assessments? (e.g., speed management, infrastructure planning etc) – dig into practical examples where possible
- What challenges do you face in doing these assessments?
- How do you rate your capability/skill in undertaking network risk assessments (explore skill, resource, capability gaps). Can you identify the top ‘gap’ that needs to be addressed?
- Are there any other gaps or things you need support with (eg data?)
- If no or limited assessments are done:
  - How do you identify high risk roads and intersections?
  - How do you plan road safety treatments/interventions?
  - Are you familiar with different network assessment techniques (elicit examples)
  - Are you planning on doing assessments in the future?
  - What do you need to do these assessments? Explore capability, resources, skills guidance etc
  - Anything else?
- What support (if any) do you get from the state/territory to do these assessments?
- What support (if any) do you get from your LGA to do these assessments? (if relevant)
- Have you seen any other councils doing great work in this area? Who? (elicit contacts)