

Safety camera network framework



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Introduction

Safety cameras are a proven road safety intervention and have been an integral part of road safety success in leading jurisdictions for many years. There is a substantial body of evidence that demonstrates their effectiveness in reducing deaths and serious injuries. Safety cameras are effective at both detecting and deterring illegal behaviours.

The risk of being caught is a strong motivator to drive safely for many, and the ability to deploy cameras anywhere, anytime allows them to influence driver behaviour across the road network.

The approach of NZ Transport Agency Waka Kotahi (NZTA) to safety cameras forms part of an integrated whole-of-system response to road safety that includes safety infrastructure, enforcement, vehicle technologies, safe and appropriate speed limits, public advertising and engagement. Our approach includes partnership with enforcement activities undertaken by NZ Police to hold people to account for illegal behaviours where there is potential to cause serious harm.

The overarching objective of our approach to safety cameras is to save lives, not to generate revenue. NZTA receives no direct financial benefit from safety cameras. All traffic fines generated by safety cameras are directed into the government's consolidated fund.

We are committed to be transparent about the safety camera network. This includes publishing fixed safety camera locations and providing prior notice regarding new installations. We will educate and engage to help people understand their compliance obligations and to deter illegal behaviour. The aim is not to catch people out but to follow a best practice approach to improve road safety outcomes.

This framework outlines our approach to safety cameras and sets the direction for detecting, deterring and enforcing illegal driving offences through automated enforcement to ensure we are:

using the right interventions, targeting illegal behaviours at the appropriate locations.



Purpose

This framework provides strategic direction for the establishment and ongoing operation of New Zealand's safety camera network. It is evidence-based and informed by best practice principles that targets illegal behaviours such as speeding and red-light-running.

The overarching purpose of the framework is to:

- support the delivery of sustained reductions in road trauma on New Zealand roads and streets through automated enforcement of illegal road user behaviours as part of a whole of system approach to improving road safety
- reduce the risk of fatal and serious injury crashes
- complement officer-led enforcement activities.

Officer-issued enforcement of illegal behaviours such as illegal drug use, alcohol impairment, restraint non-use, speeding, fatigue and distracted driving will continue to be undertaken by NZ Police.

Review and update of the framework

This framework may be reviewed periodically to reflect changes to the regulatory environment or advances in technology that may impact the ongoing strategic approach, delivery and operation of the national safety camera network.

The role of automated enforcement in road safety

Automated enforcement plays a critical role in delivering improved road safety outcomes by supporting wider enforcement and regulatory efforts to deter illegal behaviour and to encourage compliance with road rules. Deterrence is a highly effective mechanism to improve road user behaviour and thus road safety. This has been especially true in Australia and New Zealand who have pioneered and refined multiple enforcement policies targeting seatbelts, random breath testing and random drug testing.

Deterrence is based on well-established behavioural principles and underpins our automated

enforcement approach. Achieving deterrence is related to the actual level of enforcement (that is, the amount of network coverage), as well as the perceived level of enforcement (that is, the perceived risk of apprehension and perceptions of certainty) and the perceived deterrence value of penalties (that includes perceptions of severity and swiftness).

There are 3 key deterrence-related concepts linked to enforcement that inform our automated enforcement approach: general deterrence, specific deterrence and site-specific deterrence:

General deterrence

This refers to the extent to which road users are deterred from engaging in a certain behaviour such as speeding, not because they have been caught, but because they believe they are likely to be caught and because the consequences are considered undesirable. This concept relies on the perception that detection and apprehension are possible at anytime and anywhere across the road network, that deters offending.

Specific deterrence

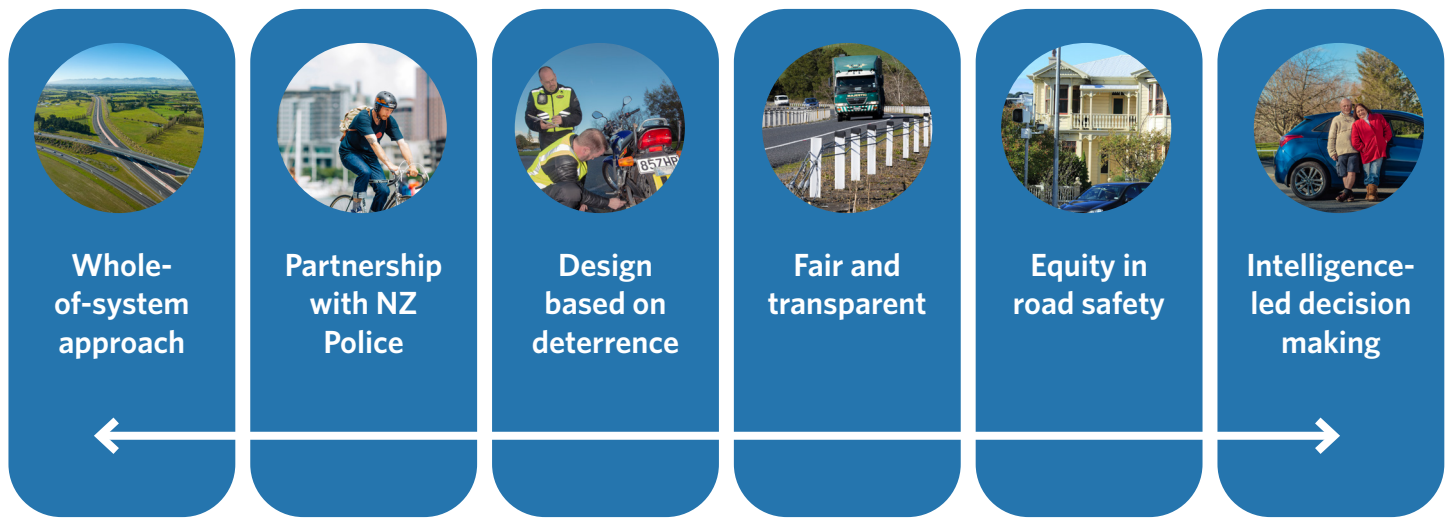
This refers to the extent to which a road user is deterred from engaging in a certain behaviour because they have been caught and penalised for that behaviour before and don't want to experience the consequences again.

Site-specific deterrence

This refers to the extent to which a road user is reminded of a risk and deterred from engaging in a certain behaviour at a particular site or on a particular stretch of road, typically a high-risk site, with targeted interventions such as fixed cameras.

Our approach to automated enforcement through safety cameras is supported by our firm and fair regulatory approach¹ in partnership with NZ Police. We encourage people to be safe and to understand their compliance obligations, and we enforce to hold people to account and to deter people from breaking the rules.

¹ [Tū ake, Tū māia: our regulatory strategy 2023-32](#) NZTA, 2022.



Safety camera network principles

There are 6 principles in this framework that underpin and guide our approach to safety cameras. These principles are drawn from international best practice and NZTA policies and strategies. They provide a practical and enabling approach to safety camera network planning and implementation. The principles are to be applied together and complement each other.

The overarching objective of our approach to safety cameras is to save lives.

Whole-of-system approach

Most people are aware of and comply with road rules and regulations. However, we know people make mistakes and that people take risks which may harm themselves and others. It's important to be responsive to the reasons for people's behaviour as well as to understand that the way the transport system is designed also has an influence on behaviour.

For example, understanding the design outcomes of safety infrastructure and its relationship with illegal behaviours is critical to determining the role of safety cameras. While some safety infrastructure measures such as median barriers will safely support higher speeds, even our expressways and motorways are not designed to operate safely at excessive speeds.

Partnership with NZ Police

The safety camera network needs to be effectively operated within a wider enforcement environment that includes coordination with officer-led enforcement from NZ Police.

This is essential to ensure that safety cameras, particularly mobile safety cameras, are deployed in a coordinated manner, recognising the critical role that a sustained and highly visible police presence has on increasing perceptions around the likelihood of illegal behaviours being detected. We'll work with NZ Police to ensure that site selection, scheduling and deployment of mobile operations is carried out in an appropriate manner across all regions.

Design based on deterrence

This is achieved through scale of camera network coverage and ensuring that changes to the network are effectively communicated. Such measures, supported by ongoing efforts to raise and maintain awareness, have been shown to effectively increase general deterrence for most people. Ideally, our safety camera network would result in no infringements being issued because road users are making safe choices.

Fair and transparent

NZTA is firm and fair in its regulatory approach. This means we are balanced and proportionate in how we consider factors such as non-compliance risk, willingness to comply and the public interest.

We're transparent about our safety camera network by publicly publishing the locations of all fixed safety cameras. We educate and engage to help people understand their compliance obligations and use road safety cameras to deter illegal behaviour and hold people to account when they break the rules. The aim is not to catch road users out but to follow a best practice approach to improve road safety outcomes through reducing the prevalence of illegal behaviours.

Equity in road safety

We know that communities across New Zealand have different experiences in engaging with the transport system. When it comes to road safety outcomes certain demographics are over-represented in the deaths and serious injuries. Our approach focuses on ensuring that we consider risk equally across the transport system to address this inequity of transport related harm.

While safety cameras treat individuals equally in terms of detection, we know that the consequences experienced aren't always equitable. It's important that we continue to support enforcement operations with meaningful engagement, effective communication and support for those inequitably impacted by enforcement activity.

Intelligence-led decision making

NZTA incorporates relevant information around illegal behaviours, road trauma and road environments alongside insights from our partners that supports data driven identification of sites and informed integration and operation activities. Where appropriate, information will be shared with NZ Police to ensure our safety camera network is well integrated and informed.

National safety camera network

NZTA adopts an internationally recognised best-practice approach to safety cameras which includes a mix of camera types and a mix of overt and covert operations. Research has shown that a mix of overt and covert speed cameras generates greater road safety benefits than either one alone². Using a range of different camera types including fixed spot speed cameras, dual red-light/speed cameras, average speed cameras and mobile cameras enables automated enforcement.

Camera types

Each camera type plays a unique role to support both site-specific and general deterrence and to achieve optimal behavioural and safety outcomes. Fixed cameras, average speed cameras and intersection safety cameras are focused more on being highly visible to achieve a site-specific deterrent effect within the general vicinity of the locations or sections treated with cameras.

Mobile cameras focus more on achieving a general deterrent effect through what is commonly referred to as an 'anytime, anywhere' approach. A mix of both approaches is considered best practice.

Table 1 shows reductions in death and serious injury (DSIs) for different camera types based on a review of Australian and international studies, as well as observations from existing fixed cameras in New Zealand.

Table 1: Effectiveness of different safety camera types

Camera type	DSI reduction
Average speed cameras	48%
Fixed point speed cameras	20%
Intersection safety (red light) cameras	27%
Mobile cameras	15%

Fixed spot speed cameras

Fixed spot speed cameras detect the speed of vehicles by using electronic sensors that accurately measure the speed of the vehicle at a specific location. If a vehicle is detected speeding, a digital image of the vehicle is recorded including the vehicle type and the number plate of the vehicle. Fixed speed cameras have the capacity to measure speed in both directions. Fixed speed cameras are usually readily observed or soon identified by drivers and provide a strong message that speeding is dangerous.

Intersection safety (red light) cameras

Intersection safety (red light) cameras can enforce both red light offences and detect vehicle speed at signalised intersections. Radars or laser techniques are used at intersections to detect if a vehicle crosses over the stop line against a red traffic light, and fixed speed camera technology is combined to detect speeding offences.

Average speed cameras

Average speed cameras (also known as point-to-point cameras) measure the average speed over a road section (from as little as 500 metres to many kilometres of road lengths). The vehicle is identified when entering the enforcement section, and again

² Job, S., Cliff, D., Fleiter, J.J., Flieger, M., & Harman, B. (2020). [Guide for determining readiness for speed cameras and other automated enforcement](#). Global Road Safety Facility and the Global Road Safety Partnership. Geneva: Switzerland.

when leaving it. The average speed is calculated based on the time interval between these 2 points. If the vehicle's average speed exceeds the speed limit for the length of road, the driver will receive a penalty for speeding.

Average speed cameras are highly effective at improving safety over a length of road. They're perceived more favourably, as any offence is derived from persistent speeding, not a momentary lapse in concentration.

Mobile cameras

Mobile speed cameras are a speed limit enforcement device fitted in a parked vehicle or trailer to monitor the speed of passing traffic. Mobile road safety cameras use a radar to determine the speed and the direction of a vehicle. The camera can detect speeding vehicles in one or both directions and from either side of the road.

Mobile average speed cameras

Where the 'mobile speed camera' and 'average speed camera' methods are combined. This has the potential benefit of shifting operations around the network to strengthen deterrence.

Safety camera signage

Overt enforcement is carried out from marked vehicles or roadside installations, and is accompanied by signage and information advising drivers of the presence of enforcement operations. In contrast, covert enforcement relies on an absence of local signage and advice to drivers of local enforcement activities, to create an expectation that people who choose to engage in illegal behaviour may be caught anywhere at any time.

This evidence informs our approach to signage for various camera types.

- Permanent average speed cameras are to be signed because their role and effectiveness rely on road users knowing that they are being carefully monitored along a corridor.
- Mobile average speed cameras are to be signed only when the cameras are present.
- Fixed spot speed cameras are to be signed to reinforce their site-specific effect.
- Intersection safety (red light) cameras are to be signed to reinforce their site-specific effect.
- Mobile cameras (vans/trailers) are not to be signed. This is because they are most effective at optimising the general deterrence effect. Mobile cameras will continue to operate under the existing 'anytime, anywhere' approach.



Warning period and use of safety notices

New safety cameras are implemented under a staged approach, which incorporates an initial warning period with safety notices issued for low level speeding. The aim is to alert motorists to their speeding behaviour and allow the opportunity to comply before enforcement action is taken (unless the level of speeding is serious, in which case enforcement action may be taken during the warning period).

The warning period is fixed and communicated to road users with an explicit date for the start of enforcement. This is done to:

- deliver certainty
- formally start the period of safety notices
- increase perceptions of fairness
- provide a set end to the advertised advanced warning period.

The warning period will be a minimum of 4 weeks between the camera 'go live' date and the camera 'enforcement' date, which is considered sufficient time to achieve a high level of compliance. The same warning period will be used for new fixed cameras as well as for existing cameras when a speed limit has been lowered.

Approval and removal of safety camera locations

New safety camera locations will be determined by NZTA in consultation with the appropriate road controlling authority and NZ Police.

NZTA would only consider removing a safety camera if a fundamental change to the road environment could adequately achieve similar or better road safety outcomes than the safety camera.

Prior to the removal of any safety camera, NZTA would seek endorsement from our partners at NZ Police and the appropriate road controlling authority.

Inclusion of automated enforcement in road design

To achieve the greatest safety and efficiency benefits, safety cameras should be considered during the planning and design phase of all new roads. For example, consideration of proposed infrastructure that could also be used to implement safety cameras, provision of enforcement bays for mobile speed camera vehicles, as well as police.

This is especially key when the road environment limits the enforcement options available, such as in tunnels, bridges, expressways and on motorways.

Site selection principles

Safety camera sites are selected using a data driven methodology that delivers on both site-specific and general deterrence.

Safety camera sites and appropriate camera type are derived from a strategic safety camera programme which considers road trauma risks across the network, the effectiveness of different camera types and existing road user behaviours (such as speed profile) with the aim of achieving optimal improvement in road safety performance.

Other factors that inform the safety camera network include, detailed site investigations and consultation.

Below are the 9 key principles that inform site selection and camera type. All safety cameras, locations, or lengths are recorded in a central database to ensure transparency, accurate network coverage and reporting.

Camera type effectiveness

Average speed cameras are the preferred camera type, particularly for higher volume roads, because the sphere of influence is extended over the entire length.

Fixed spot speed cameras are especially useful where there exists a site-specific risk or the corridor is short in length.

Road trauma levels

Locations and corridors across the state highway and local road network are determined based on deaths and serious injuries and/or the prevalence of illegal behaviours resulting in road trauma. This can be either specific to the collective population (collective risk) or at an individual level (personal risk).

Crash types

The predicted high-risk crash types that may be considered to occur at a location, such head-on or run-off-road crashes along a corridor or right turn crashes or vulnerable road user crashes at intersections.

Evidence of excessive illegal behaviours

Evidence of illegal behaviours occurring is an indication of the potential for deaths and serious injuries to occur. Data collected on exceeding the speed limit or red light running are examples of evidence used to inform decisions.

One Network Framework

The categorisation of roads and streets is an important indicator of their intended movement and place functions. This helps to design and align road environments and operating speeds to the type and levels of activity between different road user groups.

Road safety partners

NZTA works in partnership with local authorities, iwi and NZ Police as part of implementing the safety camera network to ensure local knowledge and context is considered during the site selection process.

Operational challenges

Safety camera locations where there are operational challenges and/or it is unsafe to deploy officer-led enforcement or mobile safety cameras, such as tunnels, expressways and motorways, are also given consideration for fixed safety camera enforcement.

National coverage

Consideration is given to the distribution of safety cameras across the transport network to support equitable safety outcomes and support general deterrence in a fair and transparent manner.

Integrated planning, delivery and operations

Safety cameras are considered as part of a wider range of safety interventions. All selected sites are subject to a site validation process and safety assessment undertaken by NZTA.



Community awareness

Using the appropriate communication tools is critical in:

- helping the community understand our approach to safety cameras
- facilitating perceptions of fairness of process
- encouraging people to start changing their behaviour ahead of safety camera enforcement
- achieving deterrence goals.

Evidence shows the importance of effective and well-timed communications to inform people about the changes that are being made. For example, implementation of more safety cameras and the use of average speed cameras. There's an emphasis on the unavoidability of detection - meaning that people exceeding the speed limit will be caught.

This is critical to supporting perceptions of the likelihood of being detected and achieving the goal of general deterrence and shifting behaviour before detection.

Communicating information with all road users at a local, regional and national level is important as well as using different information channels to ensure a wide reach to various communities.

Māori engagement

NZTA recognises and respects Te Tiriti o Waitangi and will work with Māori to build strong, meaningful and enduring relationships to achieve mutually beneficial outcomes. Te Ara Kotahi: our Māori Strategy, provides strategic direction on how we work with and respond to Māori as the Crown's treaty partner, and what this means for how we do business.

Our existing evidence suggests that Māori are over-represented in fatal and serious injury crashes. NZTA understands the value of a partnership with Māori and are committed to ensuring that the safety camera network doesn't unfairly target enforcement at Māori.

NZTA is committed to establishing and maintaining a process to provide opportunities for Māori to contribute to the development of the safety camera network.

Public information and education

Enforcement works best in combination with public education to achieve maximum road safety results. Educating road users about the risks of illegal driving behaviours and informing them about enforcement, gives road users the opportunity to modify their behaviour, and in turn fewer are infringed for illegal driving behaviours. The key objective is to design and implement educational information that informs the public about speed, the role of safety cameras and the enforcement of people's illegal behaviours.

A high level of public understanding is required prior to enforcement commencing, giving an appropriate level of advanced warning. Advance awareness offers the community transparency of what NZTA is doing by demonstrating fairness, with the return expectation of improved compliance. We're giving people the opportunity to comply before we start issuing infringement notices.

We want the public to be aware that the approach to enforcement is changing with increasing use of technology. We want people to understand how automated enforcement works and what it means for them.

For our safety camera network to be successful we will need to:

- help people understand what role safety cameras play in enforcing and reducing road trauma
- warn people of the coming changes to speed enforcement, emphasising that people exceeding the speed limit will be caught
- provide an explicit date for the start of enforcement (with best practice warning periods in advance to make it fair and to encourage habit change).

Innovation and technology

Driving behaviours, automated compliance and enforcement technology is constantly evolving. Technology providers are constantly developing ways to automate enforcement of offences including use of cameras to detect illegal behaviours associated with mobile phone offences, non-use of restraints and tailgating among a range of other offences. Any new solutions considered for use in New Zealand must have the potential to reduce road trauma. NZTA aims to complement existing technology with new technology, deploying a mix of camera types to deter illegal driving behaviours.

Any potential new or improved solutions will be required to undergo significant testing and be required to meet specific performance requirements set by NZTA before implementation. Additional fit for purpose camera technologies targeting a range of unsafe behaviours would also be subject to selection through rigorous procurement processes.

Public education and communication will be required to ensure the public is aware of any additional road rule offences being enforced through new cameras or other technology, and the road safety risk being addressed.

For NZTA to consider the use of new solutions, the following needs to be well understood:

- Evidence base for such technologies in reducing road trauma.
- Indirect social consequences that could arise from implementing such technologies, such as privacy.
- The role that technology could play in supporting other programmes or initiatives to ensure a 'system based' approach.
- Whether a trial-based approach can support understanding the above.

Technology requirements and criteria

Any new or improved technology-based enforcement solutions considered for use in New Zealand must have the potential to reduce road trauma.

The solution will need to meet the following behaviour criteria:

1. An illegal road behaviour.
2. A key road safety risk.
3. Automated enforcement of the behaviour is expected to reduce the risk of road trauma.

If the behavioural criteria are met, the technology itself will be carefully considered for use in New Zealand based on the:

- effectiveness and accuracy of the technology in detecting the specific offence/s
- cost effectiveness of the technology
- ability of the technology to meet any privacy or information security requirements
- safety in deployment - considering risks to workers, the community and the environment
- success of the technology in achieving road safety benefits in other international jurisdictions.



Monitoring and evaluation

A core part of the framework is evaluation to confirm that the safety camera network is successful in achieving its purpose and to identify ways in which it can be improved. NZTA is also committed to ongoing monitoring and evaluation of this framework.

Evaluation and performance monitoring of the safety camera network and provision for review of the framework are key to ensuring success and ongoing improvement.

Performance monitoring and evaluation

Performance monitoring and evaluation of the safety camera network ensures we are informed by evidence and intelligence. This allows us to drive and influence changes in our approach to safety cameras to ensure it continues to be fit for purpose.

Effective monitoring and evaluation are important to:

- demonstrate to decision makers the road safety outcomes achieved through effective enforcement
- communicate the road safety benefits to achieve and maintain support
- inform decisions about expanding the safety camera network and optimising the existing operation of safety cameras.

Monitoring and evaluation will include:

- Road safety performance.
- Compliance with road rules at safety camera locations.
- Network level deterrence.
- Public perception of deterrence and safety cameras enhancing safety outcomes.
- Lessons learnt.

Road safety performance

Road safety performance indicators will be required to be measured at a network level to monitor the effectiveness of the safety camera network in achieving improved road safety outcomes.

Examples of key performance indicators (KPIs) to monitor road safety performance include:

- Number of DSIs with speed being a contributing factor.
- Number of vehicle occupant deaths where restraints were not worn.

Compliance at safety camera locations

This indicator will be measured as a percentage of traffic complying with speed limits and red light running at safety camera locations. This will be applicable at all fixed, corridor-based and mobile speed enforcement locations, and will inform targets associated with site-specific deterrence.

The compliance rate will be measured as a lead indicator of the safety performance of the safety cameras. The number of deaths and serious injuries involving drivers not complying with the required road rules will also be measured.

Examples of key performance indicators (KPIs) to monitor compliance include:

- Proportion of vehicles exceeding the speed limit (urban and rural).
- Proportion of red light running at intersections.
- Proportion of vehicle occupants wearing a seatbelt.

Network level deterrence

Previous studies have shown how the use of scientific methods such as empirical Bayes analysis can be used to assess whether mobile camera programmes are achieving network level deterrence. This requires both the hours of mobile camera enforcement (dosage) and the network coverage (randomness) to be monitored as an indicator of success. Low dosage and randomness are unlikely to yield sustained road safety outcomes at a network level.

The total length of roads that have a camera detection presence will also be captured which is necessary to assess the DSI rate at treated locations. This information along with monitoring of travel speeds in adjacent road environments and the network more generally will provide NZTA with insight as to whether network level deterrence has been achieved.

Examples of key performance indicators (KPIs) to monitor network level impacts include:

- Length and percentage of the road network covered by automated safety cameras.
- Hours of mobile camera enforcement.

Public perception

Social surveys are undertaken periodically to understand public perception of the efficacy and the effectiveness of safety cameras. Information captured should also include demographic, geographical, and social information to inform NZTA on different strategies to improve public perception, such as through targeted education campaigns.

Examples of key performance indicators (KPIs) for public perception include:

- Percentage of the public who understand the risks associated with illegal behaviours such as speeding or not wearing a seatbelt.
- Percentage of the public who agree that safety cameras are an important intervention to reduce road deaths and serious injuries.
- Percentage of the public who agree that they are likely to get caught when driving over the posted speed limit.
- Percentage of the public who agree that they are likely to get caught when undertaking risky behaviours.

Lessons learnt

One of the ways that NZTA can continually build its knowledge base, is to develop and implement a lessons learnt framework. This will inform how different cameras may be used, targeting different types of locations or whether there is an enhancement to internal systems, processes or documentation which could further enhance benefit.

Limitations

Adopting the monitoring and evaluation outcomes within this framework will focus attention on illegal behaviours. There are important limitations to be aware of when it comes to performance indicators:

- Indicators are not objectives on their own. They're intended to enable decision making targeted towards trauma reduction and delivering against road safety targets.
- Performance indicators may need to change over time, particularly as technology, priorities and risks change over time.
- Safety performance indicators alone cannot give a holistic overview of the road safety system and should be supplemented with additional information to get a better understanding of the land transport system.

There may also be challenges with the accuracy and practicality in capturing all the ideal data requirements.

