



# **The Safe System Approach in Action**

Safe System Assessments in  
New Zealand

Case study

This case study is part of a package of materials accompanying the final report of a joint International Transport Forum–World Bank Working Group, entitled *The Safe System Approach in Action*.

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# Introduction

This case study was prepared by a joint International Transport Forum–World Bank Working Group convened in 2020–2021. The case study forms part of a package of materials accompanying the Working Group’s final report, *The Safe System Approach in Action* (ITF, 2022a).

The Safe System approach to road safety takes as its starting point the ethical position that there is no acceptable level of road deaths and serious injuries. The report proposes a framework for designing, implementing and assessing projects with a Safe System focus. It draws on lessons from real-world case studies to offer guidance on implementing Safe System interventions.

The Working Group analysed 17 case studies in total, paying special attention to their Safe System content. While not every case study was a perfect example of the Safe System approach, all contained valuable lessons. In addition, several common themes emerged. A separate ITF Working Paper (2022b) sets out the thematic analysis.

This case study contains four parts. First, it provides context for the specific intervention and the road-safety problems it aimed to solve. Second, it outlines the interventions implemented to solve these problems and the results. The analysis is structured according to the five key components of the Safe System framework outlined in the main report (ITF, 2022a), namely:

1. **Establish robust institutional governance.** Permanent institutions are required to organise government intervention covering research, funding, legislation, regulation and licencing and to maintain a focus on delivering improved road safety as a matter of national priority.
2. **Share responsibility.** Those who design, build, manage and use roads and vehicles and provide post-crash care have a shared responsibility to prevent crashes resulting in serious injury or death.
3. **Strengthen all pillars.** When all road-safety pillars are stronger, their effects are multiplied; if one part of the system fails, road users are still protected.
4. **Prevent exposure to large forces.** The human body has a limited physical ability to tolerate crash forces before harm occurs; the system should prevent those limits from being exceeded.
5. **Support safe road-user behaviour.** While road-user errors can lead to serious harm, the Safe System focuses on roads and vehicles designed for safe interaction with road users. It supports humans not to make mistakes and tune their tasks as much as possible to their competencies.

Third, the case study identifies lessons from the project, again structured according to the five key components of the Safe System framework. Fourth, it offers conclusions.

Access the full set of case studies on the ITF website: <https://www.itf-oecd.org/safe-system-in-action>.

# Context

**New Zealand's Vision Zero aims to eliminate transport deaths and serious injuries by 2050. Achieving this vision includes integrating Safe System Assessments into project delivery. Based on a similar system used by Austroads, the assessments provide a structured way to identify elements of road design and operation that need to be modified to achieve closer alignment with Safe System outcomes.**

*Road-safety themes: Safety-performance indicators, Infrastructure investments*

On average, one person is killed every day on New Zealand roads and another seven are seriously injured. New Zealand recognises that deaths and serious injuries should not be an inevitable cost of travel. In December 2019, the New Zealand Government released Road to Zero, the national road safety strategy to 2030. The strategy has a vision for a New Zealand where no one is killed or seriously injured in road crashes. The strategy sets New Zealand on a path towards Vision Zero and is underpinned by the principles of a Safe System. This long-term ambition is supported by interim 2030 targets and a focus on five key focus areas: infrastructure improvements and speed management, vehicle safety, work-related road safety, road-user choices, and system management.

The system management focus area was introduced into the Road to Zero strategy in recognition that strong leadership, effective co-ordination, enhanced sector capability, engagement and partnership with communities, better data and evidence to inform decision making, greater accountability for actions, a focus on results, and monitoring and assurance of outcomes are all critical to achieving road safety objectives.

A further critical element of the Road to Zero strategy is embedding the Safe System approach into key policy frameworks and system design guidance. An action under the first Road to Zero Action Plan 2020-22 is to update New Zealand's road safety audit guidance to embed Safe System principles and incorporate Safe System Assessments.

The problem is that investment in road infrastructure projects is often not contingent on achieving Safe System outcomes. There is therefore a need for road agencies to methodically consider Safe System objectives in road infrastructure projects and, ideally, to link these objectives to investment outcomes.

A Safe System Assessment Framework provides a structured way to assess how closely road design and operation align with Safe System principles, and to clarify which elements of a project need to be modified to achieve closer alignment with Safe System outcomes. New Zealand contributed to the development of the Austroads Safe System Assessment Framework (Austroads, 2016) and national- and local-level road-controlling authorities have used the framework to optimise road safety outcomes from road infrastructure projects and programmes.

The Austroads framework considers key crash types that lead to fatal and serious crash outcomes, as well as the risks associated with these crashes (exposure, likelihood and severity). It provides prompts to ensure each pillar of the Safe System is considered. A treatment hierarchy is also provided to help identify the most effective treatments that might be used to minimise death and serious injury. The framework was developed following a review of literature on Safe System infrastructure and existing risk assessment frameworks.

In 2018, a pilot project was undertaken by Waka Kotahi New Zealand Transport Agency to explore the possibility of formally adopting the Safe System Assessment Framework in New Zealand through the Safe Roads Alliance.

The Safe Roads Alliance was established by the New Zealand Government in 2015 to reduce the number of deaths and serious injuries on high risk rural state highways through a programme of safety improvements including safety barriers, wide centrelines, improved road signs and markings, rumble strips, wider road shoulders, intersection upgrades, and safe and appropriate speed limits.

The objectives of the pilot were to explore the value of Safe System Assessments as applied to different projects, project stages and organisations/departments and to build capabilities and capacity in New Zealand to undertake Safe System Assessments.

Auckland Transport has also recognised the potential for Safe System Assessments to help assess how closely road design and operation aligns with Safe System objectives. Auckland Transport has adopted Vision Zero in its transport safety strategy, which aims to eliminate transport deaths and serious injuries by 2050. One of the initiatives being progressed as part of working towards this goal is the integration of Safe System Assessments into project delivery.

## **Funding**

In New Zealand, road safety audits must be undertaken for projects to receive funding under the National Land Transport Fund (NLTP). At the time of writing, a new road safety audit guide is being developed which will aim to embed Safe System Assessments as part of the wider road safety auditing process. With the associated mandate for funding, this effectively formalises the requirement for Safe System Assessments to be undertaken during the early stages of project design and development. In the latter stages of project design, Safe System Assessments will give way to more traditional road safety auditing practices. However, the results of early-stage Safe System Assessments will be carried through to later stages and further assessments may still be required or relevant at later stages.

## **Actors and leadership**

Waka Kotahi New Zealand Transport Agency and Auckland Transport have led efforts to embed Safe System Assessments in New Zealand. Other local road controlling authorities have also played a key role in developing and adopting their use. Waka Kotahi New Zealand Transport Agency is leading the embedment of Safe System Assessment into New Zealand's road safety audit guidance and has led efforts to raise industry capability and capacity through training. Leadership and the actors involved vary when Safe System Assessments are applied at a project level.

### Example Safe System Assessment: State Highway 1, Dome Valley

Dome Valley is a 15-kilometre long section of State Highway 1 that provides an important link between Northland and Auckland for commuters, freight and tourists but has a poor crash history and contains unexpected curves, poor visibility and steep slopes. Between 2006 and 2015 there were 17 fatalities and 45 serious injuries on this road section. A project was developed under the Safe Roads Alliance to reduce the risk and potential severity of future crashes, particularly relating to head-on, run-off-road and intersections crashes.

Figure 1 shows a typical road layout on Dome Valley prior to safety improvements, highlighting the winding and hilly nature of the road with no physical central median separation and only partial treatment of roadside hazards. The second image in the figure shows some of the safety improvements being applied including a median barrier to separate opposing traffic flows and roadside safety improvements.

**Figure 1. State Highway 1 Dome Valley before and during safety improvements**



Source: Waka Kotahi New Zealand Transport Agency

The design developed by the Safe Roads Alliance included a range of options both with and without median barriers, roadside barriers, shoulder widening and wide centerlines. A Safe System Assessment was undertaken for each option. The primary focus of the assessment was to evaluate the relative safety afforded by each option through the provision of varying lengths of different safety interventions.

The assessment highlighted the critical importance of Primary Safe System infrastructure interventions such as median and roadside barriers. The Safe System Assessment favoured the option that provided the highest level of protection from serious trauma, noting that: “To obtain the highest alignment with Safe System principles in the high-speed midblock sections of this road, consider implementing continuous roadside and median flexible barriers.”

# Interventions and results

## Establish robust institutional governance

New Zealand is embedding Safe System principles and Safe System Assessments through updated road safety audit guidance in accordance with the Road to Zero national strategy and Action Plan 2020-22. This follows a number of trials and experience using the Austroads Safe System Assessment Framework.

For example, a six-month trial of the Auckland Transport urban Safe System Assessment Framework was undertaken for projects delivered by the Road Safety Engineering, Traffic Engineering, and Operations Planning and Performance teams. In that trial, training was provided to all relevant teams to ensure consistent application. Following the training, Safe System Assessments were undertaken on all scheme assessment projects over a six-month period. A standardised form was then provided for all projects to be scored against. Finally, a questionnaire was completed following each assessment to identify the influence of the Safe System Assessment on the design process, any issues with the assessment, and whether improvements to the process could be made.

A post-trial review highlighted matters such as project options being progressed which did not have the best Safe System Assessment Framework score, possible project exemptions to the process, and the possibility of a more simplified framework for small-scale projects. Processes were developed to address these and other matters. As an outcome of this trial, work is underway to apply Safe System Assessment Framework to all Auckland Transport projects.

## Share responsibility

The need for system designers to share responsibility for creating a safe transport system is well established in New Zealand through the Road to Zero strategy and previously the Safer Journeys strategy (2010-2020). This is being supported by a substantial industry capability-building programme to support an increase in the use of Safe System Assessments and to reinforce the role of system designers.

In 2018, the Safe Roads Alliance pilot project included an initial two-day workshop attended by 23 participants from the Alliance which provided in-depth training on the Safe System Assessment Framework and how it is applied to projects. The workshop was followed by five additional workshops around the country to raise awareness and generate interest in the use of Safe System Assessments. These workshops involved local Alliance representatives, Waka Kotahi NZ Transport Agency project managers and designers from each region.

## Strengthen all parts

Safe System Assessments are primarily focused on investments in safe infrastructure. However, they also help influence other parts of the system including setting of safe speed limits, road use and activity, vehicle safety and post-crash care. Safe System Assessments are also a key part of system management.



## Prevent exposure to large forces

The primary benefit of a Safe System Assessment is to influence design decisions that lead to greater implementation of Primary Safe System interventions that are more closely aligned with Safe System principles, increased protection against exposure to large forces and better road-safety outcomes.

## Support safe road-user behaviour

Safe System Assessments give consideration to interventions that help reduce road-user errors as well as various factors associated with the likelihood, exposure to and severity of crashes.

### Box 2: Example Safe System Assessment: Church Street/Victoria Street intersection, Onehunga

Auckland Transport identified this intersection for safety improvement based on safety deficiencies and a record of 39 crashes reported over a five-year period, the majority of which involved crossing or turning vehicles. Two options were considered for upgrading the intersection: (a) traffic signals with pedestrian crossing facilities on all approaches; and (b) a single-lane roundabout with traffic calming and zebra crossings on all approaches.

The Safe System Assessment Framework was applied to the two proposed options in order to assess and compare the existing intersection. The roundabout was confirmed as a Primary Safe System treatment that provided the highest Safe System alignment and greatest protection against exposure to large forces in the event of a crash. Based on this assessment, the roundabout option was progressed and has since been constructed. Before and after images of the intersection are shown in Figure 2.

Figure 2. Church Street/Victoria Street intersection before and after safety improvements



Source: Waka Kotahi New Zealand Transport Agency



# Lessons

## **Establish robust institutional governance**

Following early trials and experience with Safe System Assessments, New Zealand is updating its road safety audit procedures, which are linked to investment in projects under the National Land Transport Fund. Embedding Safe System Assessments into New Zealand's road safety audit guidance is a key activity under the Road to Zero Action Plan 2020-22.

Auckland Transport has also taken steps to embed Safe System Assessments into its Enterprise Project Management Framework (EPMF). The aim of the EPMF is to provide a standard approach to project management and achieve consistency and best practice across all departments in the delivery of projects. The EPMF includes a six stage-gate process which covers a project from establishing purpose, preparing a business case where appropriate, and through to design and implementation.

Work is currently underway to make it compulsory for Auckland Transport projects to include some form of Safe System Assessment. In particular, Safe System Assessments will be included in the first stage gates. This will ensure that Safe System Assessments are applied right from project inception and will set up the framework as a core tool to be used at key decision-making points in project development.

## **Share responsibility**

Since the initial training sessions run as part of various pilot programmes, Waka Kotahi New Zealand Transport Agency has continued to advance its sector capability-building programme through a number of activities including the Safe System Engineering Workshop. This is New Zealand's longest-standing road safety course, designed for a technical audience, which has been delivered for more than 20 years. This five-day course includes an introductory session and practical assignments on Safe System Assessments. This is considered an introduction; those seeking to become experienced practitioners advance to a Safe System Assessment virtual course developed and delivered by the private sector.

As Safe System Assessments are incorporated into New Zealand's road safety audit guidance, there will be an increased need to ensure good knowledge and capability among the country's transport professionals. Further planned capability development activities include substantially increasing the number of participants across the wider industry who are trained in Safe System Assessments; creating introductory options targeted at decisions makers and key stakeholders who need to understand why and how Safe System Assessments are used, but who do not need the full practitioner option; and building a community of practice and providing ongoing learning opportunities.

## **Strengthen all parts**

In its early use of the Austroads Safe System Assessment Framework, Auckland Transport recognised that there were opportunities to make the framework more fit for purpose to their local road transport system and range of projects. Specifically, Auckland Transport considered that the original Austroads framework had a focus on higher speed, high-risk crash types (e.g. run-off-road, head-on, and intersection crashes). This was considered adequate for assessing projects on rural roads, where these crash types are most

prevalent. However, crashes involving people walking, cycling and riding motorcycles have become a major concern in Auckland as the use of these alternative transport choices increases on arterial roads for which they have not been designed.

In 2018, therefore, Auckland Transport developed the Crash Risk Assessment Framework (CRAF), which took the Austroads Safe System Assessment Framework and significantly expanded the crash types considered for pedestrians and cyclists. The CRAF was trialled on an arterial corridor to assess existing crash risk and the effectiveness of proposed improvements. Following the CRAF trial, Auckland Transport's Urban Safe System Assessment Framework was developed. This modified framework more closely resembles the Austroads version, but with a stronger focus on pedestrian and cyclist crash types. The intent of these changes was to make sure pedestrian and cyclist safety is more directly considered and given more weight in the scoring of options, making it more suitable for an urban environment.

Auckland Transport also made amendments to the framework scoring process to improve both the consistency of assessing large corridor projects and of the scoring between segments.

## Conclusions

Embedding Safe System principles in the management of road safety – and especially in road safety audit processes – has proven valuable in improving the safe delivery of infrastructure projects. While the focus on infrastructure does not exclude other areas, its effects in terms of improved protection and reduced speeds is helping to shift attention away from fixing the road user and towards broader system elements. This shift has been achieved through high-level strategic planning, policy setting, multiple training workshops, collaboration between multiple stakeholders, pilot projects and focused infrastructure delivery.

## References

Austroads (2016), *Safe System Assessment Framework*, Austroads, Sydney, <https://austroads.com.au/publications/road-safety/ap-r509-16>.

ITF (2022a), *The Safe System Approach in Action*, Research Report, OECD Publishing, Paris, <https://www.itf-oecd.org/safe-system-in-action>.

ITF (2022b), "Safe System Implementation in Practice", ITF Working Paper, available on request.

# **The Safe System Approach in Action**

## Safe System Assessments in New Zealand

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This case study examines New Zealand's use of Safe System Assessments to identify elements of road design and operation that need to be modified to achieve closer alignment with Safe System outcomes.

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The report also draws on lessons from real-world case studies to offer guidance on implementing Safe System interventions. While not every case study was a perfect example of the Safe System approach, all contain valuable lessons for policy makers and road-safety actors.