



The Safe System Approach in Action

The Caltrans Pedestrian Systemic
Safety Improvement Program

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

California began embracing the Safe System approach in 2019. In this programme, the transport authority (Caltrans) addresses serious pedestrian injuries and fatalities through crash modelling, statistical analysis and risk analysis. As part of the programme, districts apply low-cost, proven safety countermeasures to mitigate pedestrian collisions in crosswalks at intersections.

Road-safety themes: Pedestrian and child safety, Road-crash data, Infrastructure interventions

Every year, about 3 600 individuals die on California’s transportation system, or approximately 10 deaths per day. Of these deaths, 30% are the most vulnerable road users: people who bike and walk. While approximately 17% of all traffic deaths in the United States are pedestrians, in California the figure is 27%.

In 2020 the California Department for Transportation (Caltrans) introduced a new safety paradigm as part of its efforts to increase pedestrian safety. The process of changing road safety culture began with two organisational changes within Caltrans itself.

First, in January 2020, a Chief Safety Officer position was established, to co-ordinate Caltrans’ enterprise-level safety efforts and establish cross-functional, collaborative partnerships internally and externally. Second, in May 2020, a new Division of Safety Programs was established along with several new high-level management positions devoted to safety. Also in May 2020, staff were reorganised under the new Division to elevate safety.

With this reorganisation and all of the corresponding activities, Caltrans sought to elevate the internal visibility of safety. In doing so, it aimed to give safety the prominence, weight and emphasis it deserves. It also intended to dedicate specific resources and funds to road safety initiatives.

The Division of Safety Programs incorporated four safety-focused initiatives or “pillars” into the California Strategic Highway Safety Plan and the Caltrans Strategic Management Plan. One of these pillars is to “Implement a Safe System Approach”. This institutional commitment to a Safe System approach allowed Caltrans’ Pedestrian Safety Improvement Monitoring Pilot Program (piloted in 2016) to receive further funding and resources.

The pilot, which identified and investigated pedestrian-related high crash concentration locations, was made permanent in 2019. Caltrans then expanded its Pedestrian Systemic Safety Improvement Program to include both reactive (i.e. high crash concentration locations) and proactive components. The proactive addition to the Program addresses serious pedestrian injuries and fatalities before they occur through crash modelling, statistical analysis and risk analysis. It integrates Safe System elements and principles into a systemic approach to further the goal of zero deaths. The Program embodies many Safe System principles and elements, including the belief that safety must be both proactive and reactive to reduce deaths and serious injuries.

The Program identifies potential high-risk locations, as opposed to those where crashes have already occurred. It does so by compiling crash data which is then analysed by researchers at the University of California at Berkeley using a systemic safety model. The model identifies “systemic hot-spot” locations at high risk for future crashes. These locations are selected based on existing crash locations and their specific features, context and characteristics—thus providing a comprehensive, systemic view.

In addition, Caltrans can also prioritise locations using other factors. This prioritisation process is based on multiple variables including crash rates, pedestrian volume exposure, equity as measured by

disadvantaged communities, senior and youth population density, and school proximity. This analysis allows Caltrans to make the most informed decisions about where California should invest its resources to maximise pedestrian safety benefits.

Traffic safety investigators then implement pedestrian safety countermeasures that rely on a Pedestrian Safety Countermeasures Toolbox. A companion training course developed by Caltrans includes 47 safety countermeasures and helps investigators select the most appropriate countermeasure for each location.

The systemic component of the Pedestrian Systemic Safety Improvement Program identified over 500 locations for investigation and improvements in its first year. Caltrans has already implemented pedestrian safety interventions at many of these target locations. In early 2022, another set of 500 locations was identified for investigation and improvement. Those investigations are currently underway.

The success of the Program has laid the foundation for the establishment of additional systemic safety programmes based on a Safe System approach. Other related efforts within Caltrans include establishing a new Director's Policy on Road Safety; developing new policies and standards on proven safety countermeasures; reimagining the safety funding structure at Caltrans; building a new Highway Maintenance for Safety programme for swift implementation of safety countermeasures; and developing local Traffic Safety Plans for each of the 12 Caltrans districts in California.

Funding

Caltrans is partnering with the California Office of Traffic Safety, which provides more than USD 8 million in funding for programmes that improve and implement safe and equal access to roads for pedestrians. The California Transportation Commission recently approved USD 100 million for projects dedicated to pedestrian-focused infrastructure improvements.

Actors and leadership

The Pedestrian Safety Improvement Program is led by Caltrans. Other key stakeholders include the California Transportation Commission, the Office of Traffic Safety, the University of California at Berkeley, Caltrans Districts and Caltrans Safety Investigators.

Interventions and results

Establish robust institutional governance

The institutional framework for implementing the Pedestrian Systemic Safety Improvement program has evolved over the past several years. Due to the institutional commitment to safety and the success of the 2016 pilot, additional funding and resources have been allocated to the permanent Pedestrian Safety Improvement Program.

The partnership between researchers at the University of California at Berkeley and Caltrans was instrumental in addressing the availability and access to relevant crash databases and in the creation of a spreadsheet-based prototype tool to conduct systemic pedestrian analyses and identify safety improvements.

Caltrans also established a Chief Safety Officer position which is supported by a new Division of Safety Programs. The additional positions within Department highlight the importance of championing safety. Caltrans incorporated four safety-focused initiatives, including implementing a Safe System approach, into its Strategic-Highway Safety Plan and its Strategic Management Plan, which further institutionalises commitment to safety.

In terms of communication, a bulletin was distributed to all Caltrans districts with instructions on how to investigate the locations identified through the Pedestrian Systemic Safety Improvement Program. The instructions included an overview of the methodology developed by the University of California at Berkeley as well as improvement strategies and processes, investigation report requirements, and the specific locations to be investigated.

Share responsibility

In order to expedite improvements, it is recommended that district traffic safety engineers review existing projects to see if countermeasures can be implemented to increase efficiency. If a countermeasure cannot be included in an existing project, a stand-alone project may be initiated and funded through the Caltrans collision severity reduction program. This approach helps to improve co-operation between different programmes within a large department, resulting in efficiency, cost savings and more rapid implementation of solutions.

Strengthen all parts

Locations that meet certain factors are selected and prioritised to review and implement countermeasures relevant to location type. Criteria such as the intersection control type (signalised or unsignalised), number of lanes, and average daily traffic are included to broaden the locations where crashes were likely to occur.

Prevent exposure to large forces

A list of low-cost proven safety countermeasures was provided to mitigate pedestrian collisions in crosswalks at intersections, with failure to yield as the primary collision factor. Districts were instructed to evaluate the implementation of the countermeasures and use engineering judgement to make recommendations based on the locations.

Support safe road-user behaviour

The Caltrans Pedestrian Safety Countermeasures Toolbox contains 47 safety countermeasures applicable in different roadway contexts. Descriptions of countermeasures related to signal timing and phasing, intersections and roadway design, signs and markings, pedestrian crossings, and even lighting are presented to reduce serious injuries and fatalities.

Lessons

Establish robust institutional governance

One of the lessons from the development of the Program is the need to integrate the data collected into existing Caltrans programs and processes. Specifically, guidance on incorporating locations from the systemic safety analysis data into existing monitoring programmes should be developed. A follow-up process, including an overview of the existing process, feedback from district staff and identification of actionable changes to existing processes is necessary for successful implementation.

Building co-operation through a specific programme helps improve co-operation between different units in large departments, resulting in efficiency, cost savings, and more rapid implementation of solutions. More extensive pedestrian safety training will be necessary to institutionalise the Program. The Caltrans pedestrian safety training programme could be enhanced by providing structured, funded training. Cross-disciplinary training may help make staff more aware of informational resources and foster innovation. Finally, consistent information regarding pedestrian safety may help decrease inconsistency in implementation due to variations in interpretation by district leads.

Conclusions

The success of the Caltrans Program stems from effective integration and partnerships with stakeholders (including districts), the creation of a team to lead safety, improved use of crash and other data, effective advocacy for dedicated funding, a comprehensive mix of proactive and reactive location selections for treatment, and a toolbox to ensure that only evidence-based interventions are adopted.

One of the few barriers to effective action is the prescriptive and legislated process by which speed limits can be changed. This restricts the capacity to lower speeds to Safe System levels.

References

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

The Caltrans Pedestrian Systemic Safety Improvement Program

This case study outlines a programme developed by California's Department of Transportation to address pedestrian injuries and fatalities through crash modelling, and statistical and risk analysis.

The 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.

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.

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.