International Transport Forum

The Safe System Approach in Action

Research Report

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The International Transport Forum

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For a list of Working Group participants and their affiliations, see Annex C.

Foreword

Science has shown that implementing a Safe System approach is the most effective and efficient way to improve road safety. However, introducing a Safe System is not easy, especially in low- and middle-income countries. While there are success stories, such as the Netherlands and Sweden, applying their methods to other countries is far from easy. It requires tailor-made adjustments to the specific socio-economic circumstances of each country, city or region where the Safe System approach is applied.

The joint International Transport Forum–World Bank Working Group on "Implementing the Safe System" has developed a theoretical framework to guide those seeking to implement the Safe System approach. The framework describes how to improve the safety of roads, vehicles, road-user behaviour and other road-safety pillars through the various key components of a Safe System. Experts analysed road-safety activities and interventions in 17 case studies from all continents with this framework in mind. Some were successful; others showed that the road to a Safe System is not always well paved.

The case studies demonstrated that implementing the Safe System approach requires patience and endurance. The same is true for writing reports such as this one. The ITF has been working on this subject for decades. This report stands on the shoulders of two previous reports (published in 2008 and 2016) describing how to develop a Safe System. With each new report, the ITF moves closer to a practical, hands-on guide to implementing a Safe System. A guide that can be used in any country, city or district.

But we are not done. Once this report is published, a new Working Group will commence, focusing on a set of road-safety pilots. The aim is twofold. First, to use the Safe System framework to improve the Safe System level of each pilot. Second, to make the framework itself more practical and useful.

The ultimate goal is to turn the Safe System framework into a tool for road-safety assessment, counselling, and benchmarking Safe System implementations or indicators, to name just a few examples. The new Working Group will use the current framework and selected pilot road-safety projects for mutual improvement. The Working Group will conduct its activities in co-operation with local partners and representatives of relevant organisations, which should lead to improved results for each pilot project.

Improving road safety is a global challenge. The Working Group that produced the current report included 80 experts representing 23 ITF member countries as well as international and non-governmental organisations. Many contributed by producing case-study descriptions, analyses, sections or entire chapters. Thanks to their expertise and frankness, others can now learn what to do, what to avoid and what to undo when implementing a Safe System approach. The ITF hopes to continue designing and building a path towards Safe System implementation in the next Working Group with similar enthusiasm. The global road-safety burden is well worth it.

Henk Stipdonk, Chair of the Working Group

Blair Turner, Co-Chair of the Working Group

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Executive summary

What we did

Road crashes kill over 1.3 million people worldwide each year and seriously injure millions more. The Safe System approach to road safety can drastically reduce road deaths – but how can it be put into action? Building on the deliberations of a joint ITF–World Bank Working Group, this report proposes a framework for designing, implementing and assessing projects with a Safe System focus. In addition, it draws on lessons from real-world case studies to offer guidance on implementing Safe System interventions.

What we found

This report follows two earlier ITF reports, published in 2008 and 2016, on the Safe System approach to improving road safety. The United Nations General Assembly has endorsed this approach, and it now forms the basis for the new Global Plan for the Decade of Action on Road Safety 2021–2030. Leading road-safety organisations have also adopted it, and Safe System implementations are now increasingly common in many countries.

An important finding from previous research is that road-user error is typically the last failure in a causal chain of events. In a Safe System, all road-traffic professionals are responsible for creating the conditions for road users to comply with rules for safe travel behaviour. Overstating the role of road-user error may result in a reduced focus on effective countermeasures that address systemic failures in this causal chain.

The current report confirms that the Safe System approach is valid for all countries. The operational framework proposed in the report defines Safe System components for projects, regions, countries or organisations. This framework helps visualise what the Safe System should look like in various contexts. It also outlines the types of activities required at different stages of the Safe System journey.

The framework stresses the importance of interdependence and multiplier effects between policy interventions and actors (referred to in this report as partners). Within a Safe System, partners should not take a 'silo' approach to road-safety interventions. Although it is useful to break the road-safety problem into smaller components for analysis and planning purposes, it is critical to view these different elements as interlinked parts of the whole system.

In addition, by focusing on implementation, the report operationalises the terminology used to describe the theoretical Safe System approach. It brings together key Safe System components and traditional road-safety pillars and embeds them within the framework needed to facilitate effective implementation.

The report also presents lessons from case studies of road-safety interventions with a Safe System component. The case studies analysed by the Working Group reveal no single recipe for successful implementation. Instead, they point to a variety of approaches conditioned by national and local contexts, and the crucial role of robust institutional governance and co-operation between partners in any successful Safe System intervention.

What we recommend

Commit to a long-term Safe System initiative

Integrating existing road-safety strategies, programmes and interventions into a long-term Safe System initiative requires patience and endurance. Interventions that link crash risk with known, practical solutions have the most significant impact on reducing fatalities and serious injuries. Comprehensive and integrated solutions create multiplier effects. The Safe System approach seeks to capitalise on these effects and ensure a well-balanced set of effective interventions.

Build Safe System initiatives on data and evidence of effectiveness

Strategies and programmes need to be evidence-based, with a clear link between risk and interventions. Target-setting and monitoring of road-safety progress are essential. Road-safety authorities should collect, analyse, and use accurate road-safety data and develop safety performance indicators (SPIs).

Start at a manageable level of activity and then scale up

It is sometimes necessary to merge a long-term strategic vision with a step-by-step implementation process, starting with relatively easily achievable wins. Initial successes can help convince partners of the benefits of further investment in safety. The Safe System approach should still guide the selection and design of short-term activities.

Build capacity for practical implementation of the Safe System approach, especially in low- and middle-income countries

Fundamental policy changes require a critical mass of road-safety professionals familiar with the Safe System approach. Training and support programmes allow local experts to share experiences and demonstrate their expertise to national decision-makers. Any training should include a focus on the organisational level to reduce loss of knowledge when trained staff leave.

Use pilot projects to further test and develop the Safe System framework

Road-safety partners can use the Safe System framework to assess proposed initiatives or determine the status of Safe System development. But the framework requires further development. The Working Group has identified several pilot projects for this purpose. These pilots will be used to review and update the framework and develop detailed guidance on its successful future use.

Use the framework to assess projects, organisations and policies, identify gaps, and plan effective strategies

Once fully realised, the Safe System framework will provide a powerful method for assessing road-safety projects. Organisations, countries, regions and cities can then use the framework to determine the status of Safe System interventions. Improved strategies, programmes and interventions can help achieve the vision of zero fatalities and serious injuries from road crashes.

The road-safety challenge

The global burden of road trauma

In 2011–20, an estimated 13 million people lost their lives in road crashes and many more were seriously injured. Over 90% of these casualties occurred in low- and middle-income countries. Road crashes remain the leading cause of death for children and young adults aged 5–29 years. The huge scale of this human tragedy is deplorable. It also brings enormous social and economic costs.

But it could have been worse. In 2009, the World Health Organization warned that traffic fatalities could reach 2.4 million per year by 2030 (WHO, 2009: 2). Fortunately, such a disastrous outcome is now unlikely to occur. Instead, it is estimated that road deaths have broadly stabilised at about 1.3 million per year (WHO, 2018: 4). This represents a partial success for the first UN Decade of Action for Road Safety 2011–2020, which aimed to "stabilize and then reduce" road-traffic deaths and injuries (UN, 2010: 4).

Progress in reducing road trauma has, of course, been hugely impacted by the Covid-19 pandemic, which has massively disrupted road traffic and transport in many countries. Restrictions on movement designed to limit rates of infection have affected demand for mobility, patterns of use and exposure to injury. In 2020, with traffic volumes reduced, many countries saw marked decreases in road fatalities, although this trend was far from universal; some countries even experienced a deterioration in performance (ITF, 2021).

The international community's response

In 2020, the international community took two important decisions in favour of progress on road safety. First, in February, the Third Global Ministerial Conference on Road Safety adopted the Stockholm Declaration, proposing a new UN target to halve road deaths and serious injuries. The Declaration also called for:

> . . . a first High-Level Meeting of the United Nations General Assembly on Road Safety at the level of Heads of State and government to mobilize adequate national leadership and advance international and multisectoral collaboration in all the areas covered by this Declaration to deliver a 50% reduction in deaths and injuries over the next decade on our way to Vision Zero by 2050;[*]

Second, in August 2020 the UN General Assembly adopted Resolution 74/299 on improving global road safety. The resolution designated 2021–30 as the Second Decade of Action for Road Safety, "with a goal of reducing road traffic deaths and injuries by at least 50 per cent from 2021 to 2030". It also called on UN Member States "to continue action through 2030 on all the road safety-related targets of the Sustainable Development Goals" (UN 2020: 5).

[*] The full text of the Stockholm Declaration is available on the dedicated website of the Third Global Ministerial Conference on Road Safety: www.roadsafetysweden.com/about-the-conference/stockholm-declaration.

The Second Decade of Action for Road Safety was officially launched on 21 October 2021 with the publication of the Global Plan for the Decade of Action for Road Safety 2021–2030 (WHO, 2021). In support of the target to halve road deaths and injuries by 2030, the Plan called on governments and partners to implement an integrated Safe System approach. It made recommendations across multi-modal transport and land use planning, safe road infrastructure, safe vehicles, safe road use and post-crash response. It also recognised speed management as a critical cross-cutting factor essential to the effective implementation of the Safe System approach. Crucially, the Plan included a strong focus on low- and middle-income countries.

Road safety and the Sustainable Development Goals

The launch of the Second Decade of Action and the target to halve road deaths and injuries by 2030 are fully consistent with the commitment made by UN Member States to take accelerated action in support of the 2030 Agenda and the Sustainable Development Goals (SDGs). In fact, road-injury prevention is explicitly mentioned in the Goals for Health (SDG 3.6: Ensure healthy lives and promote well-being for all at all ages) and Cities (SDG 11.2: Make cities and human settlements inclusive, safe, resilient and sustainable) adopted by heads of government as part of the 2030 Agenda (UN, 2015).

The Stockholm Declaration, UN General Assembly Resolution 74/299 and the Global Plan recognised that improved global road safety is a driver of sustainable development. In Stockholm, for example, ministers recognised that road trauma, "if unaddressed, will affect progress towards the achievement of the SDGs" and reaffirmed their "commitment to the full implementation of the recognizing the synergies between the SDG policy areas, as well as the need to work in an integrated manner for mutual benefits". Furthermore, all three documents endorsed the Safe System approach. This represents an unprecedented consensus in favour of a human-centred approach to road injury prevention. It also provides an important opportunity to share the full potential that Safe System implementation can deliver for countries committed to achieving the 2030 road-safety targets.

A 2019 report by the Academic Expert Group ahead of the Third Global Ministerial Conference on Road Safety strongly endorsed broadening the relevance of road safety across the 2030 Agenda, stating:

> The influence of the road transportation system is so pervasive that its safety – or lack of safety – affects a wide range of social needs. Road safety – mobility without risk of death or injury – affects health, poverty, equity, the environment, employment, education, gender equality, and the sustainability of communities. In fact, road safety directly or indirectly influences many of the United Nations Sustainable Development Goals. (Swedish Transport Administration, 2019: 14).

Climate change and road safety are closely related. Policy makers need to recognise that improving road safety contributes to the climate agenda. The Global Plan for the 2021–30 Decade of Action for Road Safety (WHO, 2021) highlights this issue. The Academic Expert Group also recognised the complexity of the road transport system and the potential of the Safe System approach to contribute to the achievement of the SDGs. Among its nine recommendations was a commitment to "realizing the value of Safe System design as quickly as possible" (see Box 1).

Box 1. The nine recommendations of the Academic Expert Group

1. Sustainable practices and reporting: including road safety interventions across sectors as part of SDG contributions.
2. Procurement: utilizing the buying power of public and private organizations across their value chains.
3. Modal shift: moving from personal motor vehicles toward safer and more active forms of mobility.
4. Child and youth health: encouraging active mobility by building safer roads and walkways.
5. Infrastructure: realizing the value of Safe System design as quickly as possible.
6. Safe vehicles across the globe: adopting a minimum set of safety standards for motor vehicles.
7. Zero speeding: protecting road users from crash forces beyond the limits of human injury tolerance.
8. 30 km/h: mandating a 30 km/h speed limit in urban areas to prevent serious injuries and deaths to vulnerable road users when human errors occur.
9. Technology: bringing the benefits of safer vehicles and infrastructure to low and middle-income countries.

Source: Swedish Transport Administration (2019).

The Safe System approach

The Safe System approach to road safety takes as its starting point the position that there is no acceptable level of road deaths or serious injuries. Road users respecting the road rules have a right to expect that they should be safe. It is a "forgiving" strategy for road-injury prevention. It acknowledges that while human error on the road is inevitable, death or serious injury resulting from a crash are not (ITF, 2016: 16). It is based on an understanding that effective road-injury prevention is achieved through the interdependence and multiplier effects of various policy measures and a well-balanced set of effective interventions.

Sweden and the Netherlands pioneered the Safe System approach in the 1990s. The Swedish Riskdag [Parliament] adopted a *Nollvision* [Vision Zero] strategy in 1997, stating that "the transport system's design, function and use should be aligned so that no one is killed or seriously injured" (Swedish Government, 1997: 137). It also recognised the reciprocal rights and responsibilities of road users and managers. These two imperatives have since become cornerstones of Sweden's application of a Safe System (Belin et al., 2012; Swedish Government, 2016). A similar policy was developed in the 1990s by the Dutch Institute for Road Safety Research to promote "an inherently safe road traffic system" (SWOV 2018: 4). This vision was named *Duurzam veilig* [Sustainably Safe] and is known today as Sustainable Safety.

The Safe System approach opposes the often-repeated but simplistic claim that driver error is the cause of 90% of road fatalities. At best, driver error is the last failure in a causal chain of events leading to a crash (WHO, 2021: 9). Many crashes involving driver error also involve other critical factors such as design-induced weaknesses in vehicles and infrastructure. Overstating the role of road-user error may result in a

reduced focus on effective countermeasures that address systemic failures in this causal chain (ITF, 2018b: 13).

Four guiding principles are central to a Safe System (ITF, 2016: 26):

1. People make mistakes that can lead to crashes. The transport system needs to accommodate human error and unpredictability.
2. The human body has a known, limited physical ability to tolerate crash forces before harm occurs. The impact forces resulting from a collision must therefore be limited to prevent fatal or serious injury.
3. Individuals have a responsibility to act with care and within traffic laws. A shared responsibility exists with those who design, build, manage and use roads and vehicles to prevent crashes resulting in serious injury or death and to provide effective post-crash care.
4. All parts of the system must be strengthened in combination to multiply their effects, and to ensure that road users are still protected if one part of the system fails.

Each of these principles applies to every part of the road system. Road-safety strategies often also acknowledge the so-called pillars of road safety. To take one example, the Global Plan for the Decade of Action for Road Safety (WHO, 2011: 11–17) lists a set of activities for national-level road-safety strategies, grouped according to five road-safety pillars.

Some national plans highlight speed as a vital area of road-safety intervention (WHO, 2017; Welle et al., 2018; Job and Mbugua 2020). The Global Plan for the Second Decade of Action for Road Safety also stresses the importance of speed management, presenting speed as a crucial cross-cutting issue (WHO, 2021: 20). As a result, it is now common to refer to six global road-safety pillars.

Evidence points to the influence of speed on crash occurrence and severity. For example, according to a recent ITF study, crashes increase disproportionally with higher driving speeds (ITF, 2018b). The World Bank has also published a study showing that speed management is a vital but often under-appreciated policy lever to improve safety and reduce the negative consequences of travel, including climate-change impacts and congestion (Job et al., 2020).

The Global Plan for the Second Decade of Action for Road Safety (WHO, 2021) recognises the importance of speed management, as does the Stockholm Declaration, which called on Member States to:

> Focus on speed management, including the strengthening of law enforcement to prevent speeding and mandate a maximum road travel speed of 30 km/h in areas where vulnerable road users and vehicles mix in a frequent and planned manner, except where strong evidence exists that higher speeds are safe, noting that efforts to reduce speed in general will have a beneficial impact on air quality and climate change as well as being vital to reduce road traffic deaths and injuries.

Improving speed management is a clear instance of Safe System implementation demonstrating the ability to promote multipliers and reinforcing effects. Reducing reliance on a single pillar of action encourages a broad range of interventions to reduce speed, including road infrastructure and vehicle technology, enforcement and public-awareness campaigns.

The Safe System principles and the traditional road-safety pillars are generally regarded as valid for all contexts. As will be seen in the following chapter, when it comes to practical implementation of Safe System activities, these theoretical structures are also highly flexible and adaptable.

Benefits of the Safe System approach

The Safe System approach focuses on the prevention of injuries rather than solely on the causes of crashes. It recognises the dynamic interaction between operating speeds, vehicles, road infrastructure and road-user behaviour in a holistic and integrated way. It endeavours to manage this complex system so that the sum of the system's parts combine for a more significant overall effect. Road users are protected if one part fails.

This methodology of "defence in depth" is widely applied in other transport modes (e.g. aviation, rail and shipping). It has been influenced by the work on crash causation by James Reason, whose "Swiss-Cheese" model shows how layers of defence can reduce the risk that weaknesses in one layer or more layers will permit a final fatal failure point of destination (Reason, 1997). Building on this model, Safe System design encourages building layers of countermeasures that will protect humans even when they make mistakes.

The Safe System consists of a proactive approach to road safety rather than one that reacts to the most recent crash. It involves proactive planning, including network-wide risk assessment and analysis of underlying risk factors. Subsequent system-wide responses can then aim to reduce the risk of crashes and severe crash outcomes (ITF, 2016; Welle et al., 2018).

By reframing how road safety is perceived and managed, the Safe System approach also challenges both the general public and policy makers to reject the view that traffic fatalities are the inevitable price to be paid for mobility. By treating any road death as an unacceptable system failure, the approach discourages transport planners from using narrow measures of transport "efficiency" that implicitly tolerate traffic fatalities that are both predictable and preventable.

At the heart of the Safe System approach is a requirement to ensure that crash impact forces remain below levels that will cause death or serious injury. In the 1970s, William Haddon, the first Administrator of the US National Highway Traffic Safety Administration, highlighted the importance of human biomechanical tolerances to uncontrolled force. He elaborated a 10-point strategy to reduce harmful force on the human body, especially the brain, and developed a matrix of potential countermeasures, which served as an important precursor of Safe Systems thinking in road-injury prevention (Haddon, 1970).

The ITF and the Safe System approach

Today, the Safe System approach is at the centre stage of road-safety policy making at the global, regional and national levels. The ITF has played a leading role in promoting its adoption, publishing two significant reports on the Safe System. First, in 2008, the ITF published *Towards Zero: Ambitious Road Safety Targets and the Safe System Approach* (ITF, 2008). This report highlighted the need for a fundamental shift in road-safety policies based on the hypothesis that any level of severe trauma arising from the road transport system is unacceptable.

The *Towards Zero* report included nine main recommendations (see Box 2) and argued that the long-term vision of eliminating road deaths and serious injuries "needs to be complemented with robust interim targets for planning terms up to a decade or so" (ITF, 2008: 192).

Box 2. Main recommendations from the *Towards Zero* report

1. Adopt a highly ambitious vision for road safety
2. Set interim targets to move systematically towards the vision
3. Develop a Safe System approach, essential for achieving ambitious targets
4. Exploit proven interventions for early gains
5. Conduct sufficient data collection and analysis to understand crash risks and current performance
6. Strengthen the road safety management system
7. Accelerate knowledge transfer
8. Invest in road safety
9. Foster commitment at the highest level of government

Source: ITF (2008).

Second, in 2016 the ITF published *Zero Road Deaths and Serious Injuries: Leading a Paradigm Shift to a Safe System*. The report called for a move away from incremental improvements in road-safety policies that traditionally rely on attempts to correct human error. It argued that Safe Systems "flips this approach on its head. By working backwards from the vision of eliminating road fatalities and serious injuries, a Safe System opens up new perspectives with respect to effective instruments that reduce the number of road crashes resulting in serious trauma" (ITF, 2016: 9).

The 2016 report presented the Safe System approach as a new governance model for road safety. It recognised that effective road-injury prevention involves different government departments and agencies interacting with civil society and the private sector. And while this is organisationally challenging, it can help to overcome policy-making "silos" and promote multi-sectoral collaboration and partnerships. The report also stressed the importance of "good governance" principles of transparency, accountability, inclusiveness, and shared responsibility as the basis for integrated and complementary actions.

On target setting, the report recommended a "Management by Objectives" approach which establishes strategic goals and quantified targets. It challenged policy makers to apply "backcasting" to determine what it will take to create a Safe System approach (ITF, 2016: 67; see also Robinson, 1990). Casualty-reduction targets – such as halving road deaths by 2030 – should always be aligned with the ultimate goal of a Safe System. And such intermediate targets should be complemented with safety performance indicators (SPIs). The report highlighted the importance of SPIs as an essential diagnostic tool for addressing all relevant elements of the system.

Both reports emphasised the importance of knowledge transfer and capacity building in low- and middle-income countries. There is a common misperception that the Safe System approach is only relevant to high-income countries with comparatively large budgets and institutional capacities. However, its key principles are universally applicable. Systematic speed management through road design, for example, is an intervention that can contribute to injury prevention in all countries regardless of their level of income. Applying the Safe System approach will help identify the most effective sustainable solutions and interventions for all countries, even those with very small road-safety budgets.

To facilitate effective implementation of the Safe System approach in the Second UN Decade on Road Safety, especially in low- and middle-income countries, the World Bank Global Road Safety Facility has published two particularly relevant guides: an assessment of current road safety performance and opportunities for improvement across all pillars of the Safe System (Wambulwa and Job, 2019); and a guide on what interventions work (or do not work) to genuinely improve road safety across the same pillars, based on the scientific evidence (Turner, Job and Mitra, 2020).

About this report

The continuing validity of the ITF's 2008 and 2016 reports is clear. The Stockholm Declaration, UN General Assembly Resolution 74/299 and the Global Plan all place the Safe System approach at the centre of road-safety strategies worldwide. The challenge now is to translate these welcome aspirations into practical policy implementation. This will be especially important in low- and middle-income countries, where the burden of road injury is highest. However, effective implementation requires strong commitment at the highest levels of government and initiative across all government levels.

This third ITF report on the Safe System approach aims to assist governments and all other relevant stakeholders to support the new UN Decade of Action for Road Safety, its Global Plan, and progress towards a world eventually free from traffic fatalities and serious injuries. It proposes an operational framework for implementing the Safe System approach. This framework acknowledges the multifaceted challenge of Safe System implementation and the evolving process countries will use depending on their particular road-safety conditions.

The report also distils lessons from practical examples of road-safety interventions with a Safe System component. A total of 17 case studies were analysed, ranging from reducing speeds near school zones in Viet Nam and introducing safety performance indicators in Korea to setting up emergency care in Georgia and improving road crash data collection in Cameroon. The lessons are grouped according to the key components of the Safe System framework.

Limitations

This report naturally cannot cover all aspects of road safety, and three issues in particular are not addressed here. The first is that of modal shift and public transport. As recommended by the Academic Expert Group of the Stockholm Ministerial conference, safer road traffic will come via a shift from individual motor vehicles to cleaner, safer and affordable modes. However, this report focuses on projects aiming to make the road-traffic system safer regardless of the mode used.

Second, the report does not focus on improving motorcyclists' safety. Motorcyclists are at a much higher risk in traffic than other road users. In some countries, motorcycles are the dominant transport mode. Achieving a 50% reduction in road deaths means drastically improving the safety of powered two-wheeler riders in those cases. This report does not explicitly address this issue, as the case studies do not focus on the safety of powered two-wheelers.

Third, the report does not address the cost–benefit perspective of road-safety policy. Road crashes entail huge costs, estimated at 5% of gross domestic product (GDP) in low- and middle-income countries. There is ample evidence that road-safety interventions can result in a high return on investments, considering the increase in per-capita GDP achieved when reducing the number of road deaths and injuries (Welle et al., 2018).

A Safe System framework

One of the key outputs from the Working Group is a proposed framework for implementing the Safe System approach. The Working Group developed the framework to provide a structured way to organise – and, eventually, assess – Safe System interventions. The framework is a practical instrument but also a work-in-progress. It reflects the multifaceted challenge of Safe System implementation and the evolving process countries will need to use depending on their particular road-safety conditions.

In identifying the dimensions of a Safe System, the aim is to develop a practical instrument for further use in achieving the ultimate goal: to help countries make progress in Safe System Implementation based on practical experiences, whatever their project concerns. Whether it is about improving safety in a school zone or on a highway, regulating safe vehicles or collecting data, in all cases, the framework should provide clear guidance for improved road-injury prevention.

Definitions

The terminology used in the proposed Safe System implementation framework emphasises co-operation between partners, and interventions aiming to improve safety. Each of these terms has a specific meaning within the context of the framework.

Co-operation

Co-operation in this context refers to an alignment of partners' expectations and responsibilities concerning the set-up, implementation, operation and supervision of interventions. Co-operation can also be defined as the shaping of formal and informal relationships to yield a higher level of performance.

Partners

Partners in the context of the Safe System framework can include public, private or civil-society organisations, buyers and sellers of transport equipment and services, private and public vehicle fleet owners or individuals. They may be policy makers, police forces, road designers, vehicle importers, emergency and health care workers, road authorities at the national, regional or local level, finance organisations or other bodies. They can intervene at the administrative or operational level, make interventions or enhance their implementation. In an effective Safe System environment, partners cooperate to make the Safe System work. When partners do not yet co-operate effectively because the Safe System approach is still emerging, they should be interpreted as "partners-to-be".

Interventions

Interventions refers to all actions, measures, responses and other initiatives needed to implement the Safe System and improve the safety in all pillars. Interventions may denote sets of direct (counter)measures,

aiming to reduce the likelihood of a fatal crash or the likelihood of a crash with severe injuries. These direct measures involve actions taken across different pillars to effect some improvement in safety outcomes such as a safe road improvement (e.g. a new roundabout, or the introduction of speed cameras). Sometimes interventions may refer to programmes of cooperative actions with an organisational dimension, such as training of police officers or road designers, the setup of a road-crash data collection system or the implementation of vehicle registration systems. Despite these different types of actions, with either direct or indirect effects on traffic safety, in the proposed Safe System implementation framework these are all covered by the term "intervention". All interventions should be based on evidence of what works in reducing fatal and serious crash outcomes or improving road safety.

Dimensions

The proposed Safe System framework is structured around three dimensions:

1. the five key components of the Safe System;
2. the six traditional pillars of road safety; and
3. the three stages of development of any Safe System intervention.

Each of these dimensions is outlined briefly below.

Key components

As discussed in the previous chapter, the Safe System approach is guided by four fundamental principles. However, when it comes to designing, implementing and assessing Safe System interventions, the institutional governance of Safe System organisation is also crucial. Therefore, the Working Group decided to incorporate this crucial element within the proposed Safe System framework. The introduction of this element reflects the growing literature on the importance of considering the institutional context for elaborating and implementing efficient and consistent public policies (see e.g. Hill and Hupe, 2009; OECD, 2021; Pollitt, 2003). As outlined by Bliss and Breen (2009: 9–21), strong institutions are needed to address system defects and prevent system failures.

A system defect is any feature or combination of features (e.g. roads, roadsides, vehicles, road uses and speeds) that allow a serious or fatal crash to occur. For example, the absence of a crash barrier on a cliff-side road could be considered a system defect in the absence of other interventions for avoiding the crash and mitigating its consequences.

Many important institutions are involved in road-safety policy making, research, data collection, enforcement, road-design standards and vehicle inspections. Typically, a lead agency is charged with co-ordinating some of these functions. However, other organisations also play important roles. Examples include research laboratories, agencies in charge of data collection and analysis, authorities tasked with organising and defining standards for roads and vehicles, and the police.

Institutional governance requires mechanisms for co-ordinating and funding actions. Road-safety strategies must be defined, and plans of action detailed for specific periods. Road-safety action plans require appropriate funding and accountability. Governance arrangements must provide feedback to the partners responsible for concrete interventions through monitoring and ensure remedial measures are taken when needed. Because institutional governance is essential to Safe System implementation, it represents the first key component of the proposed Safe System framework (see Figure 1).

Figure 1. The five key components of the Safe System framework

	Key component	Description
	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.

The four traditional Safe System principles are re-ordered in the framework to place a greater emphasis on the practical implications of the key components, their mutual relations and logical coherence. This re-ordering is based on the recognition that humans make mistakes and are not always rational.

The framework begins at the level of institutional governance, which is independent of traffic situations or local circumstances. The subsequent key components stress the importance of co-operation between partners (shared responsibility) and a holistic approach (strengthening all pillars). Only then does the framework focus on the consequences of severe crashes, the strong forces on the body that bring serious or fatal harm and the inevitable road user error. In following this order, the framework seeks to correct the impression that road user error is at the heart of the problem. Preventing road-user errors is the finishing touch of the Safe System approach rather that its primary focus.

Road-safety pillars

Theoretically, each of the five key components in Figure 1 applies to every part of the road system and to each of the five pillars of road safety described in the Global Plan for the Decade of Action for Road Safety (WHO, 2011). In addition, many national plans now highlight speed as a vital area of road-safety intervention (Job et al., 2020; Welle et al., 2018; WHO, 2017). This report, therefore, treats safe speed as a separate pillar, yielding the following six road-safety pillars:

1. Road-safety management
2. Safe roads
3. Safe vehicles
4. Safe speeds
5. Safe road-user behaviour
6. Post-crash care

(It should be noted that the Plan for the Second Decade of Action also highlights multimodal transport and land-use planning as important starting points for a Safe System. The framework developed to assess progress in the present report does not yet extend to this aspect of safe and sustainable mobility.)

An ideal Safe System implementation programme addresses all five key components and all six pillars at the same time. However, the Safe System framework acknowledges the reality of partial Safe System implementations. This acknowledgement makes it possible to describe any example of a Safe System based on two dimensions: key components and pillars.

Together, the two dimensions create a simple matrix of combinations. In each combination, safety improvements can be made, Safe System principles can be implemented and assessed, and opportunities for improvement can be identified. The pillars define the columns of this matrix, while the key components define the rows (see Table 1). Within such a matrix it is possible to locate the different interventions and identify the partners needed to build co-operation and implement the Safe System approach. The framework also makes it possible to provide an overview of the different pillars and key components addressed in a specific Safe System intervention. Progress can occur through improvements in individual cells or any combination of cells.

Table 1. The Safe System framework

Key component	Road-safety management	Safe roads	Safe vehicles	Safe speeds	Safe road-user behaviour	Post-crash care
	Road-safety pillar					
 1. Establish institutional governance						
 2. Share responsibility						
 3. Strengthen all pillars*						
 4. Prevent exposure to large forces						
 5. Support safe road-user behaviour						

* Five of the cells in this row are merged into a single cell, as the key component "Strengthen all pillars" leads to simultaneous safety improvements across all pillars.

Development stages

To assess progress and identify implementation gaps in developing a Safe System, the Working Group found it useful to define the various stages of Safe System development. This report identifies five possible stages (see Figure 2) applicable to any country, region or city.

- Starting: There is no knowledge of Safe System principles and hence no activity in the direction of Safe System implementation. Road safety measures are either incidental responses to incidental crashes or not based on scientific evidence.
- Emerging: There is awareness and knowledge of what a Safe System looks like. Interventions are being put in place, although not in any systematic way. These interventions are nevertheless based on scientific evidence.
- Advancing: Interventions and policies are linked and organised by robust institutional governance focused on road safety, transport and mobility. Interventions are harmonised and systematic in the context where they are applied. In addition, "social norms" for road safety are emerging.
- Mature: Highly sophisticated technical and public-policy interventions are implemented. The influence of non-transport and mobility policies on safety outcomes is recognised and integrated in road-safety policies. Mechanisms are in place to enable accountability and capacity to assess quality and performance of the system.
- Perfect: In this hypothetical Safe System implementation, there are zero fatalities and zero serious injuries.

As there is no Safe System context in the starting stage, and a perfect Safe System implementation can never be achieved, only the emerging, advancing and mature stages are described in this report. Taken together, these three stages comprise the third dimension of the Safe System implementation framework. They signify a gradual progression from simplicity to complexity. At one end of the scale, an emerging system combines straightforward interventions and an initial process of co-operation and integration. At the other, a mature system combines sophisticated interventions and progress towards an ideal situation.

However, it is important to note that some countries or cities working towards Safe System implementation may be in the starting stage in some cells, and in the emerging or advancing stage in other cells. Furthermore, while the starting stage refers to the absence of a Safe System intervention, this could mean either that there is no intervention or that the interventions being adopted are not based on scientific evidence for their effectiveness.

Figure 2. The stages of Safe System development

Stage 0: Starting	Stage 1: Emerging	Stage 2: Advancing	Stage 3: Mature	Stage 4: Perfect
There is no knowledge of Safe System principles and hence no implementation of Safe System activities.	There is awareness and knowledge of what a Safe System looks like.	Interventions and policies are linked and organised by robust institutional governance focused on road safety, transport and mobility.	Highly sophisticated technical and public-policy interventions are implemented.	In this hypothetical Safe System implementation, there are zero fatalities and zero serious injuries.

Indeed, governments often adopt interventions on a common-sense basis (Turner et al., 2021). For example, one intervention to improve the driving behaviour of inexperienced drivers (i.e. those who have recently passed their driver exam) is vehicle-control training. However, there is no evidence that such interventions improve safety; in fact, they may make no difference or actually even increase crash risks for trained drivers (see e.g. Ker et al., 2003; Turner et al., 2021; Roberts et al., 2001). It is likely that this is because drivers who receive this training are over-confident in their driving abilities and take more risks while driving (Gregersen, 1996; Katila et al., 2004). This example highlights the importance of implementing science-based Safe System interventions to improve road safety.

This report describes the Safe System framework in two ways:

1. A high-level strategic framework that examines the combinations of key components and pillars. This is a conceptual description of what each cell denotes (see Table 2).
2. An operational framework that is applicable to practical situations. It provides descriptions of what road-safety situation to expect in each of the three different stages of development of Safe System implementation. A draft of this three-dimensional framework is presented in Annex A.

The high-level strategic framework

The high-level strategic framework comprises a two-dimensional matrix with the six pillars on one axis and five key components of Safe System strategies on the other, and "cells" at the intersection of each (see Table 2).

At this level, the framework provides a generic description of the components in a Safe System and should therefore be seen as a guide. It cannot be used to assess the level of Safe System implementation. Instead, it is designed to identify the implications of the key components and pillars, and their combinations, for policy and interventions.

The framework also provides clear guidance on which aspects of the Safe System to include during assessments of projects or organisations. This makes it possible to identify gaps and specific opportunities for actions to improve safety.

In each of the cells, improvements in safety can be made, Safe System principles can be implemented and assessed, and opportunities for improvement can be identified.

Table 2. The high-level strategic framework

Key component	Road-safety pillar	Description
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.	**1. Road-safety management**	Road-safety activity is based on a funded, integrated, multi-sector strategy and action plan and appropriate regulation. Strategies contain clear goals, objectives and performance indicators based on analysis and interdepartmental co-operation. Responsibilities are based on the knowledge that partners can prevent system defects and reduce the consequences of errors by road users.
	2. Safe roads	Standards and road-safety assessment and maintenance programmes on road networks acknowledge the safety requirements of all relevant road users.
	3. Safe vehicles	Regulation of registration, insurance and periodical testing of vehicles should apply to all vehicle types and characteristics, including both active and passive vehicle-safety features.
	4. Safe speeds	A co-ordinated, consistent and well-communicated approach to setting and enforcing safe speed limits is based on functional road classes and the needs of all road users.
	5. Safe road user behaviour	A co-ordinated system exists to regulate road-user behaviour, education and awareness, training and communication, and enforcement. The system is well-tuned to road-user competencies and inclusive of all types of road users.
	6. Safe post-crash care	Co-ordinated mechanisms and programmes for emergency interventions are available, including fast medical response and transport; and appropriate equipment and training for first responders, trauma centres and rehabilitation programmes.
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.	**1. Road-safety management**	Multi-sector road-safety policy co-operation, development and delivery involve partners at different administrative levels.
	2. Safe roads	Partners have clear institutionalised and aligned roles and responsibilities consistent with Safe System outcomes in the design, operation and use of roads.
	3. Safe vehicles	Partners co-operate in the development and implementation of a full set of vehicle regulations, procedures and policies to ensure high safety standards for vehicles and safety equipment.
	4. Safe speeds	Partners co-operate to ensure that speed limits are determined based on the functional class and context of the road (particularly vulnerable road-user activity) and that appropriate speed legislation, design, driver education, vehicle technology and enforcement support these limits.
	5. Safe road user behaviour	Road-user behaviour is within safe limits, due to coherent legislation, education, enforcement, infrastructure, vehicle technology and road-user actions. Transport companies and authorities (e.g. private and public vehicle-fleet owners) have a responsibility to create the conditions for compliance with the rules by their drivers.
	6. Safe post-crash care	Communications systems and appropriate equipment, training and co-ordination allow for immediate and effective application of care, including from first responders, hospitals and trauma centres.

Key component	Road-safety pillar	Description
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.	**1. Road-safety management**	A detailed understanding of road-safety issues (e.g. causes of fatalities and serious injuries, safety performance indicators) is linked to an integrated, inclusive response based on a multi-sector strategy.
	2. Safe roads **3. Safe vehicles** **4. Safe speeds** **5. Safe road user behaviour** **6. Safe post-crash care**	Partners recognise how their respective areas function in co-operation with others to deliver Safe System outcomes, and this is reflected in manuals, practices, funding and policies. *These cells are merged into a single cell, as the key component 'Strengthen all pillars' leads to simultaneous safety improvements across all road-safety pillars.*
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.	**1. Road-safety management**	Standards for dealing with the physical elements of the system (and compliance with these standards) play an important role in a programmatic and evolving approach to road-safety management.
	2. Safe roads	Human vulnerability for all transport modes dictates the design, operation and use of roads under all circumstances.
	3. Safe vehicles	Vehicles are equipped with systems (active and passive) to protect road users, both inside and outside of the vehicle.
	4. Safe speeds	Speed limits are set based on human vulnerability and supported by road design, enforcement, driver education and vehicle technologies.
	5. Safe road user behaviour	Road users are prevented from experiencing large forces by vehicle equipment (including safety equipment such as helmets) and technology, enforcement and infrastructure.
	6. Safe post-crash care	*Covered in other cells.*
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.	**1. Road-safety management**	Analysis of human-centred risks and effective and co-ordinated road-safety intervention programmes prevent (serious) crashes caused by human error. Funding is allocated to support these interventions, which are assessed.
	2. Safe roads	The design, operation and use of roads are based on principles to prevent human error, and there is good stakeholder engagement in road-infrastructure projects.
	3. Safe vehicles	Active-vehicle systems are included in motor vehicles, providing high levels of road-user protection. Safety standards for bicycles (i.e. for brakes, helmets, lights) are in place.
	4. Safe speeds	Safe and credible speed limits are set, aiming at the natural acceptance of these limits and supported by road design, enforcement, driver education and vehicle technologies.
	5. Safe road user behaviour	Road-user errors are prevented through provision of knowledge on road-user requirements, and this is supported by vehicle technology, enforcement and infrastructure.
	6. Safe post-crash care	*Covered in other cells.*

The operational-level framework

The operational-level framework comprises the two-dimensional high-level strategic framework, plus the stages of development of Safe System implementation. This three-dimensional matrix allows the framework to be applied to practical situations. It provides descriptions of what road-safety situation to expect in each cell, for each of the three stages of development towards Safe System implementation.

A draft of this three-dimensional framework is presented in Annex A, which provides descriptions for each cell, including exemplary Safe System activity that can be undertaken. Each cell also describes a pathway from early stages of Safe System development through to maturity (via "emerging", "advancing" and "mature" stages). This allows practitioners to identify progress towards full Safe System implementation.

The framework demonstrates that implementing a Safe System involves many tasks and partners. There is no simple recipe for implementation. Indeed, countries such as Sweden and the Netherlands have been working on Safe System implementation for decades now, and development continues. The framework's three dimensions (key components, pillars, and development stages) illustrate this complexity. One can focus on a single pillar, key component or even cell to see what is needed to improve the Safe System.

Possible applications

The Safe System framework serves several possible purposes:

1. To provide general guidance about interventions that should be considered by countries applying the Safe System approach, depending on their stage of development.
2. To analyse the Safe System content of existing cases of Safe System implementation. This can encourage improvement by evaluating lessons learned, and collecting information about possible future steps to enhance effectiveness.
3. To assess pilots, planned Safe System projects or sets of interventions to help improve their Safe System content, identify opportunities for improvement and provide professional guidance to maximise effectiveness.

The framework allows a detailed analysis of Safe System implementation. It makes it possible to evaluate the extent to which an existing or planned road-safety project can be considered a contribution to developing a Safe System and where there is room for improvement. The framework should help identify appropriate interventions, acknowledging that improvement is a process of evolution across decades. It allows for Safe System improvement at all stages of development.

The framework is meant to help guide new projects toward improved Safe System content at all stages of policy development, not just to produce a list of interventions for a perfect system. Partners can apply the framework at all scales of implementation (i.e. in a country, region, city or district). Once complete, the framework will provide a mechanism to help identify the current level of Safe System progress. This can be applied to a project, region, country, or organisation, as well as to interventions and activities. And it can be tailored to the relevant stage of safe system development (emerging, advancing, mature). One additional benefit is that the framework will help explain in more practical terms, and through examples, the key concepts leading to better operationalisation of the Safe System approach.

Lessons from the case studies

Case studies and themes

This chapter brings together lessons from practical examples of road-safety interventions with a Safe System component.

Working Group members nominated examples of interventions from all over the world. A total of 17 case studies were selected (see Annex B). The Working Group analysed the case studies, giving 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 from the analysis of the case studies. In brief, the themes identified were:

1. Speed management: Experience shows that speed management is the most effective way to reduce the influence of speeding on crashes. Speed management is an integrated set of interventions including legislation, infrastructure design, enforcement, communication campaigns and intelligent transport systems (European Commission, 2018; ITF, 2006).
2. Road-safety strategies: Road-safety strategy development is part of a paradigm shift (ITF, 2016) involving actors facing different constraints and defending particular interests. While a single intervention might be easy to implement, developing a strategy requires many extra steps, including exchanges between stakeholders and ongoing investments (ITF, 2008: 103).
3. Safety performance indicators (SPIs): Unsafe elements or processes in the road-safety system need to be identified and evaluated. SPIs are based on an understanding of the processes that lead to crashes and injuries. They identify potential problems in the road traffic system proactively and improve the performance of the road-safety system by introducing appropriate changes to it (ETSC, 2001; Hakkert et al., 2007;).
4. Road-crash data: In-depth research data usually reveal what happened during a crash, although this is often imperfect, especially when accounting for the role of speed (Job, 2020). Sets of crash data collected on a regular basis can identify recurring problems on specific roads, for specific travel modes and other variables, and hence inform policy responses. Data may not always cover all crashes, especially if an outcome is less severe. Linking police and hospital data makes it possible to determine the number of road deaths and serious injuries much more accurately (ITF, 2011). Data analysis allows policy makers to create appropriate road-safety policy targets.
5. Infrastructure interventions: The design of individual road sections and intersections should be in agreement with their traffic function, prevent serious conflicts and support safe road-user behaviour. Safe road design aims to minimise the risk of crashes and, where crashes continue to occur, to minimise injury outcomes (see e.g. SWOV, 2019). It strives to provide a road environment that is both self-explaining and forgiving.

6. **Pedestrian and child safety:** Pedestrians are unprotected and easily injured or killed by any powered vehicle. Child pedestrians are overrepresented in traffic as other modes are often unavailable for them. In a safe traffic system, pedestrians are separated from other traffic as part of a broader approach that delineates road types by their function and design.
7. **Partners:** In the Safe System approach, the role of lead partners is central to road-safety management and strategy development. The WHO defines the existence of a lead agency as one of its main road-safety indicators (Bliss and Breen, 2009; WHO, 2018). However, other actors and organisations also need to translate defined strategies and policies into concrete measures, tools and actions.
8. **Local-government interventions:** Managing road safety on municipal roads is challenging. Local governments often manage highly complex road networks that vary widely in functions and uses. In a Safe System, local authorities must establish a clear road hierarchy that effectively manages potential conflicts between different road users. Achieving this end-state may take decades.
9. **Fleet safety:** Government and company fleet purchases account for most new-vehicle sales in some countries. Safer fleet purchases benefit the safety of a company's employees. Independent consumer information sources, such as new-car assessment programmes (NCAPs), can also help fleet managers make safer decisions, particularly in countries with weak vehicle-safety regulations.
10. **Post-crash care:** If all other pillars are fully functioning in a safe traffic system, comprehensive post-crash responses theoretically become less important. This may be one reason why post-crash care has not been a high priority for road-safety actors. But in achieving the vision of no road deaths, adequate and timely post-crash response is indispensable.

While these themes do not form a part of the current report, interested readers can find extensive thematic analysis in a separate Working Paper (ITF, 2022). As detailed in Annex A, each of the 17 case studies engaged with at least one of these themes, indicating that common lessons can be drawn from widely divergent contexts.

Lessons for Safe System implementation

Given that the current report proposes a theoretical Safe System framework, this chapter groups the lessons from the case studies according to the framework's five key Safe System components. In doing so, it offers a practical example of how the framework could be used. Under each key component, sub-headings point to common issues across the different case studies, framed as suggested actions.

	Key component	Description
	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.

Develop integrated strategies and programmes

Implementing and extending a Safe System approach involves developing appropriate strategies and programmes linked to reducing fatalities and severe injuries. Such programmes need to cover different risk factors and call for a systematic approach linking various interventions. They must also be comprehensive, treating each risk factor with a range of dedicated actions. For instance, regulating speeding could involve simultaneous actions related to speed enforcement, traffic-calming programmes and speed zones.

Strategies and programmes need to be steered by a lead agency composed of skilled senior staff experienced in policy implementation. Defining a Safe System strategy requires setting ambitious and achievable targets that can be measured and evaluated. These targets make it possible to track performance and communicate results to decision makers and the public.

Some of the case studies identified the need for a sustainable implementation process that starts at a manageable level of activity and then can be scaled up. This incremental approach provides a learning process and builds co-operation involving different partners. This co-operation can evolve through successive implementation stages, making it easier for policy makers to manage incremental changes.

Base strategies and interventions on evidence and data

A Safe System strategy and its interventions needs to be based on evidence. It must be sound and backed by decision makers. While public support is also helpful, it will not necessarily exist in the early stages of strategy development. The absence of public support alone is no reason to delay or abandon implementing the strategy.

A crucial step in a road-safety risk-assessment exercise involves identifying the specific road-safety problems. Crash data, in-depth crash analysis and knowledge of the theory of crash risk provide a basis for establishing quantifiable targets. Analysing previous projects aligned with Safe System requirements can also provide valuable lessons.

Lead agencies and governments need to define and monitor safety-performance indicators (SPIs). SPIs are beneficial when overseeing the implementation of public policy or conducting an evaluation. However, they also need to be aligned with targets, interventions and specific safety issues. SPIs may need to evolve

to improve their accuracy. In addition, appropriate SPIs can assist authorities in implementing road-safety policies at the local level.

Choosing adequate SPIs and collecting SPI data also plays a role in monitoring the effectiveness of interventions in the field. Consequently, it is essential to engage major partners in the data-collection process from an early stage. These partners will need to be informed about the objectives of the process. Once they understand their roles in that process, they will be less likely to oppose it.

Knowledge, data and information about interventions are critical tools for overcoming resistance from other public actors and stakeholders. The need for evidence is especially relevant when convincing the public and decision makers about new or innovative solutions with which they may be unfamiliar. But it also has an educative purpose. Lead agencies and governments need to be transparent about the data used to justify interventions. Partners, researchers and citizens require access to this information.

Providing access to SPIs and other data also entails ensuring the collection of such data is well-managed, performed regularly, and in line with relevant standards. For this reason, it may be practical to invite existing institutions (e.g. independent research centres, universities or road-safety institutes) to develop and manage related information systems. This kind of involvement responds to the need for co-operation and trust between partners.

Provide adequate funding

Adequate funding is essential for the successful implementation of road safety plans. Data, facts and logic play critical roles in securing road-safety funding. They make the process of prioritising investments straightforward. They also make it easier to avoid investing in interventions for which there is no sound evidence for saving lives or reducing injuries.

Several case studies demonstrated the value of creating a dedicated regular annual budget for road-safety interventions. This approach protects the often limited funds available for safety. But it also enables efficient assessment of return on investment and transparency in road-safety spending.

Beyond budgeting for individual initiatives in a road-safety action plan, secure and ongoing funding is needed for lead-agency functions, data management, policy development, research and public reporting. These are the foundations that increase readiness for future interventions and inform corrective action on activities underway. Moreover, a standing capacity in developing road-safety interventions often provides the initial impetus and seed funding for activities that will later become separately funded initiatives.

While establishing dedicated funding is important, most partners will need to work with what they have. There is always capacity in the system, however limited, to address priorities. Tapping into this capacity, redirecting effort and re-allocating existing funding can get things started. Demonstrating results can then leverage access to further resources, and thus planning for an evaluation is vital at this early stage. In the case studies, existing resources mobilised for road safety included internal staffing and systems, temporary governance groups, and expertise and skills within government agencies.

In all cases, but especially in contexts with minimal resources, achieving and communicating early successes is vital to securing future sustained funding. In several case studies, partners leveraged funds to increase total investment in safety. Funds may, for example, support a proportion of the needed investment and require agencies to identify the remaining budget from within their means. Funding should be conditional on the provision of evidence that the proposed interventions are effective.

Create a climate for political change

High-level political will and commitment on the part of governments will facilitate substantive road-safety improvements. Similarly, private-sector organisations require strong buy-in at the highest corporate level. While creating and maintaining a commitment to change can be challenging, several case studies identified approaches to help enable this. However, in some cases key partners failed to provide support and road-safety activity and interventions lost momentum.

Raising awareness of the magnitude of the burden of road crashes in society can help. Focusing on crucial road-user groups – especially children – can be valuable, as there is a good understanding and acceptance of the need for change to protect such groups. Similarly, interventions in contexts facing severe problems (e.g. pedestrian safety) may also have greater visibility.

Non-governmental organisations (NGOs) involved in road safety can be valuable partners in supporting the need for road-safety interventions. Their involvement can help create a climate where sound political decisions for road safety receive more acceptance. The Global Alliance of NGOs for Road Safety articulates the value of the activities of NGOs in road safety (Brondum et al., 2022).

Promoting road safety depends on accurate crash data and results from in-depth studies on fatal crashes. But information on the effectiveness of interventions also needs to be communicated to decision makers and the community. Engaging directly with local communities helps empower on-the-ground advocates. In several case studies, this type of engagement aided in identifying and recruiting local road-safety champions.

Support from journalists, and effective media campaigns with clear community messages, can support the process of change. But a wide variety of partners (e.g. teachers, local policy makers and NGOs) can also assist in generating a climate for change. Some of the case studies highlighted the benefits of including these partners from the early stages of the process.

Changes implemented gradually can help build momentum. Pilot projects can demonstrate the positive impacts of targeted safety improvements (e.g. how an intervention can save lives). They also provide a way to obtain practical experience or a proof-of-concept for specific initiatives.

Ensuring buy-in at the highest possible level may require a dedicated team to oversee key activities. These could include analysing data, allocating responsibilities, and choosing objectives, interventions and indicators. The team should also create a follow-up process and take a step-by-step approach to project management and quality assurance. The make-up of the team will depend on the operating context. For instance, a national government agency could consider a national steering group. A Chief Safety Officer might lead a similar team in a corporate environment.

In several case studies, leading road-safety organisations and partners helped validate interventions and approaches and encouraged the adoption of best practices. Knowledge and promotion of broader developments in the global, national and regional context relating to public policy priorities can also help ensure political commitment and achieve policy changes.

Another promising approach is to identify “win–win” situations with other policy areas (e.g. liveable cities, health or the environment), whereby each area gains from the intervention. Such an approach is consistent with the new Global Plan for the Decade of Action on Road Safety, which highlights the importance of linkages between road safety and the SDGs.

Several case studies referred to the role of “key players” in creating the circumstances for political support. Examples include political leaders; private-sector actors (including sub-contracting firms); international

agencies (for funding and expert support); insurance companies; national, regional or local or city government agencies; NGOs; local communities (e.g. schools); and the media.

But even if such key players are convinced of the need for change, there is a need to maintain momentum. Although stakeholders may initially accept a proposal, political attention can shift over time. One prominent example is the shift that occurs after a change of political administration. While such changes can be challenging, one solution is to select a universally supported objective (e.g. child safety at school).

Key players can mobilise other partners at the appropriate levels, establish strong partnerships with local authorities and communities and draw on the support of journalists, international organisations and the private sector. They may also be able to create a cell of vocal supporters. This approach was a feature of several case studies and may be helpful when implementing contentious policy issues. Tenacious actors often play crucial roles, especially in championing unpopular interventions.

Continued civic participation helped maintain interest in road-safety projects covered in the case studies. Furthermore, one set of partners (e.g. NGOs) might initiate road-safety activity, allowing others (e.g. local road agencies) to take ownership and maintain the momentum. The Overseas Development Institute has produced guidance on increasing political support for road safety (Wales, 2017).

Co-ordinate activities between partners

The involvement of multiple partners is central to the Safe System approach. These actors' vision, skills and commitment are critical factors for success. So, too, is their capacity to influence both the institutional system and the opinions of road users. If even one partner is missing, road-safety activities can prove difficult or even impossible. Therefore, formal partnerships may be necessary to co-ordinate and strengthen policies to reduce road casualties.

Relevant partners include elected officials, civil society, NGOs, safety organisations and agencies. These actors perform a variety of enforcement, education, engineering and emergency roles. Similarly, since the road safety environment is changing, people within organisations come and go, and policies and political aspirations shift over time.

Given the vast array of partners involved in road safety, effective co-ordination can be challenging. Partners work at varying paces and with potentially different objectives. The proliferation of institutional actors can create confusion about who owns a particular action. As a further complication, partners' roles can vary at national and local levels. This variation can affect their ability to make long-term commitments.

Understanding the intrinsic motivations of the partners themselves is a necessary first step in co-ordinating activities between them. For instance, a private company might be driven by a concern to improve its performance (and ultimately profit), while politicians are more likely to be motivated by political gain. Innovations or new technologies may inspire other actors. Knowledge of such motivating factors can help initiate and improve the success of a road-safety action. Often, multiple actions coincide. Therefore, it is essential to track all efforts and produce documentation (e.g. guides and manuals) to ensure the continuity of initiatives. Documentation is particularly vital in the road-safety context because the coalition of partners and stakeholders is so broad.

A strong lead (either a person or an agency) is typically required to co-ordinate between partners. This lead role may include facilitating early socialisation of proposed activities through discussions, consultations and workshops; explaining road safety issues and the need for change; and defining the potential roles of partners in a project (Bliss and Breen 2009: 67–140).

Support training and skills development

Understanding the principles of the Safe System approach and the pillars of road safety is fundamental to advancing through the stages of Safe System development. Safety professionals will need to grow and acquire knowledge to successfully implement the Safe System in order for it to be accepted as standard procedure. Several case studies highlighted this need for capacity building.

Analysis and evaluation of existing road-safety management systems lead to a greater understanding of road-safety challenges and opportunities. Roads and transportation systems rely on design and operational standards consistent with injury minimisation and the reduction of crash forces. Professional training for road designers and operators increases their understanding of how their decisions influence and enforce safe road-user behaviours. This might involve professional education and on-the-job training.

Vehicle designs change over time, and variations also exist between countries. Road-safety professionals' design practices, therefore, must also evolve to account for these changes. Road-safety authorities cannot set speed limits on the assumption that all drivers will follow new road signage. Instead, designs and operations must incorporate an understanding of human factors to achieve, as far as possible, roads that are self-enforcing and self-explaining. Road users will also need to be educated on the reasons why lower speed limits are required. When a crash does occur, well-trained first responders will save more lives through proper emergency and trauma actions.

The Safe System framework places a great emphasis on training and skills development. Several case studies demonstrated that knowledgeable and competent staff are vital to Safe System implementation. Training should be ongoing rather than a one-time effort, regardless of the approach (e.g. introductory or topic-specific). Staff composition and organisational leadership change over time. Anchoring Safe System training within transport organisations provides the necessary continuity for the profession and allows for new knowledge and increasing expertise.

Significantly, organisations training practitioners can also develop the skills of community groups, political officials, and other safety partners. By increasing the knowledge and understanding of these road-safety actors, each can become a champion of the Safe System. Similarly, a media communications strategy can reach the goal of the Safe System by providing for a funded and structured training process.

A common theme from the case studies is that organisations implementing the Safe System need to develop training consistent with the needs of their workforce and external partners. Topic-specific training (e.g. on how to assess the Safe System design of a road) is particularly useful. In several cases, training on Vision Zero and the benefits of crash-reduction interventions was also beneficial. While a structured and government-funded training curriculum is preferable, organisations may also consider providing peer-to-peer learning opportunities within a community of practice.

Adopt an incremental approach and use the best tools available

Safe System interventions strive to reduce the risk of fatalities and serious injuries resulting from road crashes. However, a mature Safe System does not occur immediately. Individual projects and programmes should increase the overall safety of the system incrementally. Safe System implementation needs to merge a long-term strategic vision with a step-by-step approach, starting with high-priority easy wins. Achieving this requires effective institutional governance of safety-management processes.

Not all transport organisations can produce large-scale projects or programme changes. The case studies indicate that demonstration projects can be an entry point into the Safe System. For example, data collection and analysis for a single project can increase knowledge and experience. Based on this

knowledge, organisations can scale up activities in a larger geographical area. In any case, the aim is to encourage future investment in the Safe System.

At times, partners and transport agencies may differ on the best solution to a road-safety problem. Differences of opinion can occur between safety partners but also between regulatory authorities. Disagreement is also typical across local, provincial and national levels. As an example, a speed-reduction action for a school adjacent to a highway is likely to bring substantial safety benefits. But this action may conflict with the perceived economic benefits of moving motorised vehicles and freight quickly. In such instances, a temporary compromise may be appropriate, especially if the design and operation of the action take Safe System components into account. In the example outlined above, relocating the school or the road both constitute long-term solutions. A short-term compromise might involve setting a lower speed limit at times when children travel to and from school.

Every city, region and country should aim to develop projects and programmes that reduce fatalities and serious injuries. However, the scarcity of financial resources increases the need for proactive and evidence-based programmes. Tools that can assist in designing such programmes include safety-analysis software, safety audits and inspections, the resources provided by the International Road Assessment Programme (iRAP), SPIs and Safe System Assessments. In addition, programmes for pedestrians, younger road users and motorcyclist safety provide models for addressing aspects of road safety. Such tools and programmes assist in identifying risks, selecting interventions and prioritising projects. They also provide safety practitioners with real-world perspectives on the impacts of their decisions.

The case studies contain examples of programmes combining crash modelling, and statistical and risk analysis, to identify crash locations with the potential for improvement. They also recognise the need for standards and performance-based design. These may result in road design manuals, regular vehicle-inspection procedures, audits to ensure proper Safe System applications or operational road-safety inspections to ensure systems operate as expected. The goal is to have the ability to maintain the road system safely over time. When a system is not working as expected, the approach can be refined and improved through careful evaluation.

At the project level, the goal is to reduce crash forces and develop systems that support safe road-user behaviour and safe vehicles. Effective implementation capitalises on what is known to work in support of the Safe System. Road authorities can build on or repurpose existing policies, procedures, tools, projects and programmes. The maturity of the Safe System increases when individual projects and programmes work together to reduce fatalities and serious injuries.

Invest in monitoring, performance tracking and evaluation

Strategic goals and quantified targets require adequate evidence of existing road-safety problems. But regular collection and tracking of crash and casualty data alone are insufficient. Road authorities should also use appropriate safety performance indicators (SPIs).

Creating a broad set of SPIs representing traffic reality is crucial to successful road-safety strategy implementation. For example, in 2018 the Swedish Transport Authority produced a set of indicators for road safety which it now monitors in terms of progress (Lindberg, 2019: 13). Any chosen SPIs need to be thoroughly evaluated. Identifying factors that contribute to changes in serious injury rates creates a basis for change. It is also important to consider practical means to monitor and improve the accuracy of SPIs in a continuous cycle of refinement (see Box 3).

Box 3. Safety performance indicators (SPIs)

Safety performance indicators (SPIs) are tools for developing and evaluating road-safety policy. SPIs connect a specific road-safety risk factor, its countermeasure, an indicator for the amount of implementation of the measure observable in traffic ranging from 0 to 1 (100%) and the policy target for that indicator. For example, a seat belt reduces a car occupant's risk of being killed in a car crash. Policies could aim at increasing seat-belt wearing rates. These rates in traffic could then be measured separately from the wearing rates of car occupants with or without a seat belt as observed in crashes. A target could be set at 100% wearing of seat belts in traffic, or intermediate targets could be set at "50% wearing rate by the end of a specific year". Seat belt wearing rate is thus an SPI.

Hence, road authorities, the police and governments and private fleet owners can measure SPIs without undertaking crash-report analysis. Other well-known examples are helmet-wearing rates (e.g. for motorcyclists and cyclists), child-restraint use rates (for children travelling in passenger cars), and the proportion of drivers with a blood-alcohol concentration below the legal limit.

There can be SPIs for virtually every risk-reducing road-safety property. In countries where most pedestrians walk on the roadway, building footpaths and keeping them free of obstacles would be an effective risk-reducing measure. A city might want to develop a road-safety policy aimed at pedestrian safety by enhancing the proportion of pedestrian travel on footpaths and defining an SPI measuring the proportion of roads with a proper footpath. By monitoring this SPI, city authorities could regularly monitor progress. In case of insufficient progress in a specific part of the network, they could introduce further interventions to increase this SPI. SPIs can be monitored at any desired scale. Governments willing to undertake regular observation projects can present progress against selected SPIs over time.

Benchmarking processes are also useful for comparative assessments of road-safety performance (e.g. between countries, cities or companies). SPIs can then clarify differences in road-safety outputs. Comparing indicators can help identify strong and weak points in road-safety management. Such comparisons can lead to social pressure, which, in turn, can drive change. Additional indicators relate to the effectiveness of road-safety interventions. Such indicators should also be evaluated systematically to validate results achieved within a specific context.

	Key component	Description
	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.

Maintain commitment and co-operation

Shared responsibility in road safety implies a multisector, multi-actor programmatic approach. All partners (including policy makers, police, road authorities, engineers, teachers and the private sector) must maintain regular contact at and between the national and local levels. Each partner must also identify opportunities for their area of responsibility to contribute to Safe System outcomes.

This process requires awareness of the potential for improvements in every part of the system. Importantly, some responsibilities can be assigned to various partners, while others should be properly institutionalised. Examples of the latter include responsibilities for driver-licence tests, vehicle-safety tests, road and intersection design, and road audits.

The case studies illustrate the need for commitments by and co-operation between national, regional and municipal authorities. A national Safe System strategy requires a joint effort from many relevant actors and clear national leadership. Similarly, a regional or local Safe System strategy requires local leadership. However, because local interventions (e.g. lowered speed limits) affect communities, these communities also need to be involved and targeted to achieve their support. Private-sector partners may be able to assist in consulting with local communities.

Experience from the case studies showed that including influencers (e.g. journalists) in Safe System plans is fruitful. Partners' activities and enthusiasm can mobilise other key players. However, when one player remains reluctant, it may be more efficient to design a process that can do without them in the first stage of a project and try again later. At the same time, if a key player is missing from a process that counts on their active participation, that process may end in failure.

Joint funding can help foster joint approaches. Co-operation in co-funded projects (e.g. through national–municipal or public–private funding) can be effective and lasting, whereas single- or project-funded initiatives are difficult to prolong.

Provide access to information and data

Access to transparent and open data is a shared responsibility. It presents a variety of benefits and opportunities capable of increasing organisational efficiency, including increased discoverability of data; greater clarity in public policies across multiple organisations; and decisions responding to community needs rather than assumptions or intuition. Such benefits affirm the importance of building a data-driven, fair and sustainable society in which organisations are accountable and responsible for their actions.

Knowledge generated by Safe System actions, plans or interventions also needs to be shared. This includes data on crashes, injuries, fatalities and SPIs; and information about policies and goals (e.g. on speed and its outcomes, functional classifications and supporting interventions). Such knowledge sharing contributes to continuous learning and improvement. Transparency and accessibility are essential. Involving society and, in particular, organisations in this process may require perseverance to overcome resistance.

Information campaigns and results demonstrations can raise awareness and promote engagement. But they need to be developed appropriately for the intended target group. Even if the information is complex, it is essential to choose clear, friendly and straightforward messages. An effective communication strategy should transform not only people's minds but also, and above all, their attitudes.

Consider a range of supporting actions

Co-operation between partners can open up new opportunities for Safe System implementation. For example, in a Safe System, road design could be adjusted to enforce safe speeds mechanically. This adjustment is more manageable when combined with plans to build new roads or other maintenance activities (e.g. construction or maintenance of sewerage systems). Governments informing consumers and vehicle traders about vehicles safety standards may help them make safer choices. Such communication may also lead to structural improvements in the attention given to vehicle safety. A star-rating system is a practical example of vehicle-safety communication. Governments and companies could consider introducing star ratings when buying vehicles for their fleets.

	Key component	Description
	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.

Co-ordinate and co-operate when necessary

When all partners understand the causes of crashes and how they lead to serious injuries or death, it becomes possible to strengthen all pillars of road safety. Partners can then focus on addressing these causes (e.g. via road adjustments, vehicle improvements, enforcement support of safe behaviour, or information campaigns to support new policies).

In this context, the various road-safety actors must possess the necessary skills, including an awareness of their roles. Each actor should seek opportunities to contribute to their areas of responsibility, rather than expecting others to solve the problem.

Co-ordination between partners is essential when improving road safety (e.g. when changing a speed limit) but also when building new residential areas or schools, choosing the route of a bus line, or many other transport planning issues. Every transport planning intervention provides an opportunity for road safety improvement. But a transport planning department will only recognise this fact when it knows it is also responsible for road safety.

The critical question is: who needs to be consulted or informed to improve the road-safety impact of activities and interventions? If a new speed limit near a school is much lower than people are used to, this may require public awareness campaigns and media attention. Developing ways to implement lasting infrastructural interventions to support the low-speed regime, including enforcement actions, might also be necessary. The next step might be to establish road-design standards for different road categories. It may even be possible to reroute some traffic to roads with fewer pedestrians.

This example illustrates the fact that different road types or road-safety issues require the participation of different partners. Speed bumps on low-speed roads may make police speed enforcement unnecessary, while police enforcement is usually essential on high-speed roads. Hence, effective co-operation follows from the function of the co-operation itself.

Support the people working towards Safe System implementation

The individuals responsible for strengthening road safety also need to have the energy and capacity to do so. They will naturally come with different skills and from various backgrounds. Social scientists, administrators, civil engineers, modellers, data analysts and legal professionals all have roles to play. Their skill sets become essential components of any team working towards Safe System implementation.

Teams should arrange for cross-disciplinary training and encourage mutual learning. Further assistance may come from the private sector, or leading national or international organisations. Whether constructing a road-safety crash database, a safe-school zone or a lead agency for road safety, commitment from key stakeholders in high places will be very important.

Linking national and local partners is also vital. For local projects, national-level support may enhance the impact of a project and lead to wider dissemination of results. For national projects, local champions (e.g. community members, school principals) can make the first steps and lead the way for others.

Sharing budget responsibility (e.g. between national and local authorities, private and public partners, or project owners and external sponsors) can strengthen a project's financial basis. Similarly, sharing crash-data sources, data-collection methods or in-depth road crash analysis will enhance the quality and consistency of crash data. Examples include interactions between local and national police data or national hospital data systems based on individual hospital practices.

Improving post-crash care may benefit from a situational assessment. It should incorporate assessments of local emergency services and government decision makers. The case studies show that international co-operation (e.g. equipment and training donations from a high-income country) can provide a means for improving essential services. At the same time, a holistic approach is needed to take care of practical details such as availability of spare parts or of trained servicing and maintenance staff. Promising initiatives may fail if the broad picture of long-term use is not viewed. Similarly, one-off funding can lead to solutions that either decline in their effectiveness or cease to deliver benefits.

	Key component	Description
	**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.

Combine road, vehicle and speed interventions

The Safe System approach to road safety recognises that humans only have a limited tolerance to crash forces before permanent health losses are likely to occur. The focus is on preventing crashes that are likely to result in fatalities or serious injuries, rather than all crashes. In designing a road system capable of systematically reducing and eliminating the risks resulting in a fatality or serious injury, the starting consideration is energy management based on the known human tolerance to crash forces.

Effectively implemented and combined road, vehicle and speed interventions can reduce crash forces.

1. Roads: Proper configuration of the road and environment is fundamental to preventing road deaths and serious injuries. Various interventions can assist with energy management (e.g. traffic-calming interventions, forgiving road shoulders and mid-barriers on higher speed roads).
2. Vehicles: Increasing the safety of vehicles through regulation and consumer programmes (e.g. new car assessment programmes) can substantially reduce the amount of crash force transferred to the occupants and thus the risk of injury. In addition, equipping vehicles with crash-avoidance technologies can significantly increase safety for people inside and outside of the vehicle. Such technologies prevent and mitigate collisions with other vehicles, motorcycles and vulnerable road users.
3. Speeds: Speed limits should reflect the level of protection against crash risk that roads and vehicles can provide. So, for example, if the safety standards of roads and vehicles are low, speed limits should also be set lower. Then, if a crash occurs, it will be within the limits of human

tolerance and not result in a serious injury. To ensure compliance, speed limits also need to be supported by infrastructure design, legislation, vehicle systems and enforcement.

Evidence and data should form the foundation of any strategy for reducing road trauma and inform the selection of interventions. This evidence base may also help to overcome any potential government resistance. Carrying out a Safe System assessment in the early stages of strategy development can also help ensure the inclusion of Safe System outcomes (e.g. effective energy management).

	Key component	Description
	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.

Support safe road-user behaviour in a systematic way

Safety programmes are the starting point for supporting safe road-user behaviour in the traffic system. These programmes usually consist of integrated bundles of interventions addressing all road-safety pillars. For example, the most effective way to manage speeding is through a well-organised speed-management programme combining road-safety interventions at various levels. This includes legislation, infrastructure categorisation and design, enforcement, communication campaigns and intelligent transport systems.

In a complementary domain, policies intended to reduce failures by changing road-user behaviour typically need support from other pillars. For example, changes in legislation relating to speed management need to be supported by a comprehensive package of other measures. These include, but are not limited to, public-awareness campaigns and education about the legislative changes; road-infrastructure functional categorisation; and expanded (including automated) police enforcement. The speed enforcement system should be systematic, structured, visible and supported by effective punishment of detected violations.

Use knowledge and data

Proactive and evidence-based safety programmes will be acknowledged by decision makers and accepted by the public. Road-safety partners can achieve buy-in by combining crash modelling, statistical analysis and risk analysis. All three methods help identify potential crash locations and recognise dangerous traffic interactions. Partners should have knowledge of the impact of Safe System interventions (e.g. how to adjust road design to the function of a road or how to deal with drink-driving). However, crash and injury data alone are insufficient and cannot provide detailed insights into the road safety problem. Instead, SPIs can help ensure a focus on measurable intermediate objectives. SPIs need to be chosen based on a thorough analysis of road-crash data in order to understand the main contributors to the final outcomes (casualties and social costs).

Use tools and actions to support safe road-user behaviour

As detailed in the case studies, many tools and programmes support safe road-user behaviour. Examples include road-safety audits, star ratings for schools, or Safe System assessments. These tools can assist in identifying risks, selecting interventions and prioritising activities. They also provide road designers with

real-world understandings of the impact of their decisions. As a result, road designs become subject to refinement cycles to increase safety. Documenting these efforts also contributes to improved programme implementation. Producing good-practice guides and manuals ensures the continuity of initiatives and their consistency throughout time and across contexts.

Road-safety partners can support safe road-user behaviour in other areas. For example, if manufacturers produced every new vehicle according to updated safety standards, this could substantially reduce fatalities and serious injuries among both vehicle users and others. Indeed, existing technologies can help mitigate injuries and avoid collisions with other (vulnerable) road users.

Conclusions and next steps

Conclusions

One of the key outcomes from this project was the development of a Safe System implementation framework. This was developed with the intention to provide a structured approach to organising Safe System development work and eventually assessing Safe System interventions. This framework comprises a two-dimensional matrix with the six road-safety pillars on one axis and five key components of Safe System strategies on the other, and "cells" at the intersecting point for each.

Within a Safe System, a "silo" approach to interventions should never be taken. Although it is valid to break the road safety problem into smaller components for analysis and planning purposes, when developing strategy and interventions it is critical to ensure these different elements are viewed as interlinked parts of the whole system.

The case studies provided a useful source of information on road safety, and insights into Safe System initiatives in a number of low- and middle-income countries. These examples illustrate that there is no simple recipe for successful implementation, with a variety of approaches taken depending on context. Indeed, interventions that do no more than prepare the way for Safe System implementation may be equally important as more sophisticated activities at later stages of the process.

In practice, Safe System development often occurs incrementally. While progress may amount to small steps across a number of pillars, even incremental change is most effective when clearly identified as contributing to building a robust Safe System approach. Identifying the linkages maximises safety impact. Making the approach robust involves working backwards from the vision of eliminating road fatalities and serious injuries, to identify the gaps that allow mistakes to happen and serious consequences to result.

Comparing the case studies with the framework revealed that most lessons relate to institutional governance. This illustrates that implementing the Safe System often starts with co-operation between partners across a variety of institutions. Some of the most striking lessons are as follows:

- Comprehensive, evidence-based strategies and programmes are needed, which clearly link identified problems with effective interventions.
- There is a need to set ambitious and achievable targets that can be measured and evaluated so that tracking of performance is possible. Monitoring of both crash data and safety-related performance is crucial and calls for the definition of appropriate SPIs.
- There is often a need for a sustainable implementation process that starts at a manageable level of activity and then can be scaled up. This incremental approach provides a learning process and builds co-operation involving different partners.
- Evaluating the impact of interventions is essential for convincing the public and decision makers of the benefits of these interventions, and for overcoming potential resistance to change.
- For maximum impact, Safe System implementation needs to be steered by a lead agency, preferably composed of trained and skilled staff, and involve co-operation or partnership.

- Data and robust evaluations are required to secure road-safety funding, prioritise investments, avoid ineffective investments and demonstrate key safety issues and effective solutions. Crash and injury data are essential but not sufficient for detailed insight into road safety problems. A broad set of SPIs to support effective road-safety management require collection of data on patterns of mobility. Road-safety authorities need to establish a strategy for collecting and analysing the additional data required to improve the scope and accuracy of SPIs over time. The SPIs to select depend on the road-safety problems to be addressed.
- While establishing dedicated sources of funding is important, there is often a need to start work with available funding, leveraging further funding through demonstrating positive results.
- Capacity building in expertise and management in road-safety agencies is as important as the resources available for funding interventions, particularly in low- and middle-income countries.
- It can be challenging to create and maintain a commitment to bring about Safe System activity, but the case studies highlight ingredients that have contributed to success, including:
    - the emergence of "champions" that drive forward road safety activity (e.g. mayors, ministers and other politicians supported by experts) and have the ability to work in concert with social activists, local leaders (e.g. school heads) and business leaders;
    - a focus on key road-user groups (e.g. children) and high-risk locations where there is a good understanding and acceptance of the need for change;
    - engagement with non-governmental organisations, the media, local communities, and other stakeholder groups to identify key safety issues and effective solutions;
    - a decision to start with small-scale pilot or demonstration projects to build commitment and expertise, and to demonstrate potential for results; and
    - the identification of "win–win" situations with other policy areas (e.g. inclusion, liveability of cities, health, environment) where each gains from the intervention.
- Multiple partners are required for effective Safe System implementation. Assistance can come from a wide variety of sources, with case study examples including the private sector and leading national or international organisations. Given the vast array of partners involved it is important to ensure that there is effective co-ordination of activity.
- A good understanding of Safe System elements is fundamental to advancing through each stage of Safe System development (from emerging through to mature). Safety professionals need to gain knowledge to assist in successful implementation, and this requires on-going training.
- Benchmarking processes are useful for the comparative assessment of road-safety performance between multiple territories (e.g. countries, regions or cities) or even organisations. SPIs can be used to understand the differences in road safety outputs and can help find strong and weak points in road safety management using good examples as a reference. It can also lead to social pressure which can drive change.

Next steps

The case studies collected by the Working Group proved a rich source of information on road safety and Safe System development. At the same time, because they were all completed projects with an often limited scope, it was not possible to assess whether all aspects of the Safe System implementation framework could affect their success. Therefore, the Working Group identified a new set of ongoing pilot projects to further develop and test the framework. For these projects, it will be possible to influence their Safe System focus and monitor progress over time.

The Working Group selected a set of pilot projects according to a variety of criteria, including:

- the income level of the country and its geographical diversity;
- the level of implementation and readiness of the project;
- the funding stability and political will; and
- links to other SDGs.

The Working Group also consulted with local partners for each pilot to identify elements of the framework addressed by each project, as well as areas where additional Safe System components can be targeted.

An ideal Safe System pilot project must demonstrate a holistic approach and consider the fundamental and non-negotiable principles of a Safe System. It will therefore differ from a pilot implementing a single measure on road safety. Although a single measure can effectively reduce serious road crashes, the measure will be more efficient if embedded in a Safe System approach. This can include institutional, regulatory and management changes.

Each selected pilot involves implementing a defined project so that issues, lessons and barriers can be identified prior to scaling up to full Safe System implementation. The aim is to identify and analyse how successful approaches can be adapted to specific organisations and how proven efficient policies can be implemented within different cultural, institutional and regulatory environments. If implemented successfully, the pilot project can be used as a model for application and scaling up in other locations.

The focus on ongoing pilot projects offers the possibility of building a local Safe System culture, changing the way institutions work with each other, introducing the principle of shared responsibility, and matching road design and road function with speed. It also provides individuals and institutions with skills and knowledge and the ability to pass on these skills and knowledge to others for future implementation.

A new ITF Working Group that will commence in 2022 will support and monitor the pilot projects. The focus of this WG will be twofold:

1. To use the framework developed in the current report to help guide the pilots towards Safe System implementation.
2. To improve and further develop the framework by collecting experiences from the application of the framework to the pilots.

The intended result of the next Working Group is a validated framework that can be used as a practical tool for Safe System evaluations and other operational applications. A list of the chosen pilot projects is available on the ITF website: https://www.itf-oecd.org/advancing-safe-system.

References

Belin, M.-Å. et al. (2012), "Vision Zero: A road safety policy innovation", *International Journal of Injury Control and Safety Promotion,* Vol. 19/2, 171–179, https://doi.org/10.1080/17457300.2011.635213.

Bliss, T. and J. Breen (2009), *Country Guidelines for the Conduct of Road Safety Management Capacity Reviews and the Specification of Lead Agency Reforms, Investment Strategies and Safe System Projects*, World Bank, Washington, DC, http://hdl.handle.net/10986/12706.

Brondum, L. et al. (2022), "New Deal in Road Safety: Why we need NGOs", *Journal of Road Safety*, Vol. 33/1, pp. 64–70, https://doi.org/10.33492/JRS-D-21-00070.

European Commission (2018), "Speed and Speed Management", EC Directorate-General for Transport, Brussels, https://ec.europa.eu/transport/road_safety/system/files/2021-07/ersosynthesis2018-speedspeedmanagement.pdf.

ETSC (2001), "Transport Safety Performance Indicators", European Transport Safety Council, Brussels, https://etsc.eu/transport-safety-performance-indicators.

Gregersen, N. P. (1996), "Young drivers' overestimation of their own skill: An experiment on the relation between training strategy and skill", *Accident Analysis & Prevention*, Vol. 28/2, pp. 243–50, https://psycnet.apa.org/doi/10.1016/0001-4575(95)00066-6.

Haddon, W. (1970), "On the escape of tigers: an ecologic note"*, American Journal of Public Health*, Vol. 60/12, pp. 2229–34, https://doi.org/10.2105/ajph.60.12.2229-b.

Hakkert, A.S., V. Gitelman and M.A. Vis (eds) (2007), "Road Safety Performance Indicators: Theory, Deliverable D3.6 of the EU FP6 project SafetyNet", EC Directorate-General Transport and Energy, Brussels, https://hdl.handle.net/2134/4952.

Hill, M. and P. Hupe (2009), *Implementing Public Policy: An Introduction to the Study of Operational Governance*, 2nd edition, Sage Publishing, Thousand Oaks.

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

ITF (2021), *Road Safety Annual Report 2021: The Impact of Covid-19*, OECD Publishing, Paris, https://doi.org/10.1787/f3e48023-en.

ITF (2018a), *Safer Roads with Automated Vehicles?*, ITF Corporate Partnership Board Report, OECD Publishing, Paris, https://www.itf-oecd.org/safer-roads-automated-vehicles-0.

ITF (2018b), *Speed and Crash Risk,* OECD Publishing, Paris, https://www.itf-oecd.org/speed-crash-risk.

ITF (2016), *Zero Road Deaths and Serious Injuries: Leading a Paradigm Shift to a Safe System*, OECD Publishing, Paris, https://doi.org/10.1787/9789282108055-en.

ITF (2011), *Reporting on Serious Road Traffic Casualties: Combining and using different data sources to improve understanding of non-fatal road traffic crashes*, OECD Publishing, Paris, https://www.itf-oecd.org/reporting-serious-road-traffic-casualties.

ITF (2008), *Towards Zero: Ambitious Road Safety Targets and the Safe System Approach*, OECD Publishing, Paris, https://doi.org/10.1787/9789282101964-en.

ITF (2006), *Speed Management*, ITF Research Report, OECD Publishing, Paris, https://doi.org/10.1787/9789282103784-en.

Job, R.F.S. (2020), "Policies and interventions to provide safety for pedestrians and overcome the systematic biases underlying these failures", Frontiers in Sustainable Cities Policy Brief, 25 June 2020, https://doi.org/10.3389/frsc.2020.00030.

Job, S. and L. W. Mbugua (2020), "Road Crash Trauma, Climate Change, Pollution and the Total Costs of Speed: Six graphs that tell the story", GRSF Note 2020/1, World Bank Global Road Safety Facility, http://documents1.worldbank.org/curated/en/298381607502750479/pdf/Road-Crash-Trauma-Climate-Change-Pollution-and-the-Total-Costs-of-Speed-Six-graphs-that-tell-the-story.pdf.

Katila, A. et al. (2004), "Does increased confidence among novice drivers imply a decrease in safety? The effects of skid training on slippery road accidents", *Accident Analysis & Prevention*, Voil. 36/4, pp. 543–50, https://doi.org/10.1016/S0001-4575(03)00060-5.

Ker, K. et al. (2003), "Post-licence driver education for the prevention of road traffic crashes", *Cochrane Database of Systematic Reviews*, 2003/3, https://doi.org/10.1002/14651858.CD003734.

Lindberg, J. (2019), "Action plan for safe road traffic 2019–2022", Swedish Transport Administration, Borlänge, https://bransch.trafikverket.se/en/startpage/operations/Operations-road/vision-zero-academy/management-by-objectives/action-plan-for-safe-road-traffic.

OECD (2021), "Eight Ways to Institutionalise Deliberative Democracy", OECD Public Governance Policy Papers, No. 12, OECD Publishing, Paris, https://doi.org/10.1787/4fcf1da5-en.

Pollitt, C. (2003), *The Essential Public Manager: Public Policy and Management*, Open University Press, Midenhead.

Reason, J. (1997), *Managing the Risks of Organizational Accidents*, Routledge, London, https://doi.org/10.4324/9781315543543.

Roberts, G. and I. Kwan (2001), "School-based driver education for the prevention of traffic crashes", *Cochrane Database of Systematic Reviews*, 2001/3, https://doi.org/10.1002/14651858.CD003201.

Robertson, J.B. (1990), "Futures Under Glass: A Recipe for People Who Hate to Predict", *Futures*, Vol. 22/8, pp. 820–842, https://doi.org/10.1016/0016-3287(90)90018-D.

Swedish Government (2016), "Renewed Commitment to Vision Zero: Intensified efforts for transport safety in Sweden", Government Offices of Sweden, Stockholm, https://www.government.se/information-material/2016/09/renewed-commitment-to-vision-zero---intensified-efforts-for-transport-safety-in-sweden/.

Swedish Government (1997), "Nollvisionen och det trafiksäkra samhället" [Vision Zero and the traffic safety society], Proposition 1996/97:137, 22 May 1997, https://www.riksdagen.se/sv/dokument-lagar/dokument/proposition/nollvisionen-och-det-trafiksakra-samhallet_GK03137.

Swedish Transport Administration (2019), *Saving Lives Beyond 2020: The Next Steps*, Recommendations of the Academic Expert Group for the 3rd Global Ministerial Conference on Road Safety, https://www.roadsafetysweden.com/contentassets/c65bb9192abb44d5b26b633e70e0be2c/200113_final-report-single.pdf.

SWOV (2019), "Sustainable Road Safety", Fact sheet, SWOV Institute for Road Safety Research, The Hague, https://swov.nl/en/fact-sheet/sustainable-road-safety.

SWOV (2018), "Sustainable Safety: The advanced vision for 2018-2030", 3rd edition, SWOV Institute for Road Safety Research, The Hague, https://swov.nl/nl/publicatie/sustainable-safety-3rd-edition-advanced-vision-2018-2030.

Turner, B., S. Job and S. Mitra (2021), "Guide for Road Safety Interventions: Evidence of What Works and What Does Not Work", World Bank, Washington, DC, https://www.roadsafetyfacility.org/publications/guide-road-safety-interventions-evidence-what-works-and-what-does-not-work.

United Nations, General Assembly Resolution 74/299, 31 August 2020, www.undocs.org/A/RES/74/299.

United Nations, General Assembly Resolution 70/1, 21 October 2015, www.undocs.org/A/RES/70/1.

United Nations, General Assembly Resolution 64/255, 10 May 2010, www.undocs.org/A/RES/64/255.

Wales, J. (2017), "The political economy of road safety: a policy-oriented literature review", Overseas Development Institute, London, https://odi.org/en/publications/the-political-economy-of-road-safety-a-policy-oriented-literature-review.

Welle, B. et al. (2018), *Safe and Sustainable: A Vision and Guidance for Zero Road Deaths*, World Resources Institute, Washington, DC, https://www.wri.org/research/sustainable-and-safe-vision-and-guidance-zero-road-deaths.

WHO (2021), Global Plan for the Decade of Action for Road Safety 2021–2030, 20 October 2021, www.who.int/publications/m/item/global-plan-for-the-decade-of-action-for-road-safety-2021-2030.

WHO (2018), *Global Status Report on Road Safety 2018*, World Health Organization, Geneva, www.who.int/publications/i/item/9789241565684.

WHO (2017), *Save LIVES: a road safety technical package*, World Health Organization, Geneva, https://apps.who.int/iris/bitstream/handle/10665/255199/9789241511704-eng.pdf.

WHO (2011), Global Plan for the Decade of Action for Road Safety 2011-2020, www.who.int/publications/m/item/global-plan-for-the-decade-of-action-for-road-safety-2011-2020.

WHO (2009), *Global Status Report on Road Safety: Time for Action*, World Health Organization, Geneva, www.who.int/violence_injury_prevention/road_safety_status/2009/.

Wambulwa, W.M. and S. Job (2019), *Guide for Road Safety Opportunities and Challenges: Low- and Middle-Income Country Profiles*, World Bank, Washington, DC, http://hdl.handle.net/10986/33363.

Annex A. Detailed description of the Safe System framework

This Annex describes the proposed operational-level Safe System framework, which comprises three dimensions:

1. the five components of the Safe System;
2. the six pillars of road safety; and
3. the three stages of Safe System implementation (emerging, advancing and mature).

The two-dimensional framework produces a table containing 30 cells (see Table A.1).

For each cell, Table A.2 outlines activities and interventions across three implementation stages:

1. **Emerging:** There is awareness and knowledge of what a Safe System looks like. Interventions are being put in place, although not in any systematic way.
2. **Advancing:** Interventions and policies are linked and organised through robust institutional governance focused on road safety, transport and mobility. Interventions are harmonised and systematic across the context where they are applied. In addition, "social norms" for road safety are emerging.
3. **Mature:** Highly sophisticated technical and public-policy interventions are implemented. The influence of non-transport and mobility policies on safety outcomes is recognised and integrated in road-safety policies. Mechanisms are in place to enable accountability and capacity to assess quality and performance of the system.

Table A.1. The operational-level Safe System framework

Key component	Road-safety pillar					
	1. Road-safety management	2. Safe roads	3. Safe vehicles	4. Safe speeds	5. Safe road-user behaviour	6. Post-crash care
 1. Establish robust institutional governance	Cell 1.1	Cell 1.2	Cell 1.3	Cell 1.4	Cell 1.5	Cell 1.6
 2. Share responsibility	Cell 2.1	Cell 2.2	Cell 2.3	Cell 2.4	Cell 2.5	Cell 2.6
 3. Strengthen all pillars*	Cell 3.1	Cell 3.2*				
 4. Prevent exposure to large forces	Cell 4.1	Cell 4.2	Cell 4.3	Cell 4.4	Cell 4.5	Cell 4.6
 5. Support safe road-user behaviour	Cell 5.1	Cell 5.2	Cell 5.3	Cell 5.4	Cell 5.5	Cell 5.6

* Five of the cells in the third row of the table are merged into a single cell, as the key component "Strengthen all pillars" leads to simultaneous safety improvements across all road-safety pillars.

Table A.2. The detailed operational-level Safe System framework

Table A.2 comprises a series of sub-tables detailing the contents of the individual cells in Table A.1.

Cell 1.1: Establish robust institutional governance / Road-safety management		
Road-safety activity is based on a funded, integrated, multi-sector strategy and action plan and appropriate regulation. Strategies contain clear goals, objectives and performance indicators based on analysis and interdepartmental co-operation. Responsibilities are tuned to the insight that partners can prevent system defects and reduce the consequences of errors by road users.		
Emerging	**Advancing**	**Mature**
The institutional governance of road safety is elementary but coherent. In particular, a minister, mayor, chief executive officer or head of school provides leadership; co-operation between police and road authorities is growing; agencies responsible for vehicle registration and driver licences have been created; a lead road-safety agency is under development; and mutual responsibilities are in the process of being described, allocated and set. Funding, planning and settlement of road-safety responsibilities is elementary, and basic data collection and regulations are in place. The first ingredients for capacity building in the form of Safe System and traffic-safety competencies have been identified.	The institutional governance of road safety is more elaborate and directed at preventing system defects. Permanent funding and data collection, regulations and enforcement all exist. An elementary multisectoral partnership organises plans and strategies with a strong evidence base and settled responsibilities. The partnership is tuned to the insight that professional partners can prevent system defects, support safe road-user behaviour and ensure crashes will not result in fatalities or severe injuries. The partnership develops principles of good governance to ensure transparency, engagement and accountability.	Road-safety governance is well-defined, featuring a large-scale institutional structure to prevent system defects. This structure includes large-scale and institutionalised funding of road-safety strategies; detailed data collection; and regulation and enforcement aligned with the Safe System approach. A well-established interdepartmental and multisectoral partnership administers plans, strategies and responsibilities. It works with a solid evidence base that is tuned to the insight that professionals can prevent system defects. Its role is to support safe behaviour by road users and ensure that crashes will not result in fatalities or severe injuries. The partnership operates under well-established principles of good governance to ensure transparency, engagement and accountability.

Cell 1.2: Establish robust institutional governance / Safe roads		
Standards and road-safety assessment and maintenance programmes on road networks acknowledge the safety requirements of all relevant road users.		
Emerging stage	**Advancing stage**	**Mature stage**
Key road-safety partners prevent system defects through a road-infrastructure safety programme, standards and capabilities for assessments, safety audits and inspections.	Key road-safety partners prevent system defects through a well-funded road-infrastructure-safety programme that implements safety-management procedures, including assessments and training curricula.	Key road-safety partners prevent system defects in a safe road network for all road users. An integrated road-infrastructure safety programme includes comprehensive safety assessments and requirements at the road-design stage.

Cell 1.3: Establish robust institutional governance / Safe vehicles		
Regulation of registration, insurance and periodical testing applies to all vehicle types and characteristics, including active and passive vehicle-safety features.		
Emerging stage	**Advancing stage**	**Mature stage**
Road-safety authorities prevent system defects by introducing registration and inspection systems for all new and second-hand imported vehicles using UN vehicle agreements (1958/1997/1998) and their most important regulations and rules. This action is combined with consumer-information activities and requirements for vehicle insurance.	Road-safety authorities prevent system defects by applying registration, conformity of production and inspection systems to all new and second-hand imported vehicles using the UN vehicle agreements (1958/1997/1998) and their most important regulations and rules. These actions are combined with new-car assessment programmes (NCAPs) and requirements for vehicle insurance.	Road-safety authorities prevent system defects by fully applying registration, conformity of production and inspection systems to all new and second-hand imported vehicles using the UN vehicle agreements (1958/1997/1998), regulations and rules. These actions are combined with NCAPs (including regulation of intelligent speed assistance), mandatory safety labelling and requirements for vehicle insurance.

Cell 1.4: Establish robust institutional governance / Safe speeds		
A co-ordinated, consistent and well-communicated approach to setting and enforcing safe speed limits is based on functional road classes and the needs of all road users.		
Emerging stage	**Advancing stage**	**Mature stage**
Speed-management programme design is consistent across the whole road network. Speed regulations are enforced and based on knowledge of different types of roads and road users. Speed limits are communicated to the public and reflect the human body's limits when involved in a crash.	The speed-management programme includes speed regulations, speed zones and traffic-calming programmes. Automated speed-enforcement technologies have been introduced. These interventions are tuned to the human dimension involved when protecting road users from harmful energy. Speed limits are communicated to the public and enforced via an adequate penalty system.	The road network prioritises road users' safety but also considers other issues (e.g. environmental and mobility needs). The speed-management programme focuses on safety and human vulnerability at a network level. A safe balance exists between road design, speed-management programmes, access regulations and enforcement programmes. Automated roadside and in-vehicle speed-management technologies, and traffic calming interventions, enforce compliance with speed limits.

Cell 1.5: Establish robust institutional governance / Safe road users		
A co-ordinated system exists to regulate road-user behaviour, education and awareness, training and communication, and enforcement. The system is well-tuned to road-user competencies and inclusive of all types of road users.		
Emerging stage	**Advancing stage**	**Mature stage**
Road-user licensing and behaviour is regulated and supported by mandatory training and qualification of road users. An enforcement programme is applied, supported by awareness and communication activities.	A system exists for road-user licensing and the regulation of self-enforcing road-user behaviour. These interventions, together with communication and training, are tuned to road-user competencies. Additional enforcement and prevention programmes target high-risk groups, as well as drivers and riders employed by private companies. These programmes provide appropriate incentives for safe behaviour.	Regulations and licensing systems produce a consolidated, recurrent and inclusive system of self-enforcing road-user behaviour. This system is supported by communication, promotion and training tuned to road-user competencies. In addition, active programmes support safe road-user choices before and during road use. Systems designed to prevent risky behaviour (e.g. interlocks, intelligent speed assistance) provide additional enforcement and support. Other technologies that support safe road users (e.g. advanced driver-assistance systems such as collision-avoidance technologies and other driver aids) are in use.

Cell 1.6: Establish robust institutional governance / Post-crash care		
Co-ordinated mechanisms and programmes for emergency interventions are available, including fast medical response and transport; and appropriate equipment and training for first responders, trauma centres and rehabilitation programmes.		
Emerging stage	**Advancing stage**	**Mature stage**
High-level trauma care includes a central emergency contact system, a co-ordination mechanism for emergency response and interventions to enable extraction and transportation of victims. The availability of hospitals and well-trained staff are sufficient to provide health care for road casualties.	High-level trauma care includes a health database, an advanced co-ordination mechanism for fast emergency response and interventions to enable adequate extraction and transportation of victims in various relevant conditions. A suitably equipped trauma centre network, dedicated trained staff and victim-rehabilitation programmes provide health care for road casualties.	High-level trauma care includes emergency intervention feedback loops and advanced co-ordination mechanisms for delivering swift, well-equipped trauma care to victims, including various means and training for trauma-care professionals to use the resources provided. Sufficient dedicated road-safety rehabilitation centres are available and dedicated to broad coverage of the consequences of road crashes.

Cell 2.1: Share responsibility / Road-safety management		
Broad interdepartmental, multisector road-safety policy co-operation, development and delivery involves key road-safety partners at different administrative levels.		
Emerging stage	**Advancing stage**	**Mature stage**
Rather than 'blaming the victim' for traffic crashes, road-safety partners recognise that effective road-safety management is inclusive. Government departments, agencies and local partners (including the civil and private sectors) work in partnership to develop a shared strategy and plan for road-injury prevention.	The partnership approach to road-safety management is increasingly intersectoral and based on principles of good governance. Partners agree to allocate responsibilities appropriately. The partnership is capable of generating decentralised interventions in support of shared objectives, targets and performance indicators.	Road-safety management operates through a partnership model that is adaptive and accountable. Objectives, targets, and performance indicators are reviewed and reset based on a shared analysis of outcomes and areas for improvement. Road-safety management is also closely aligned with related and complementary public policy goals for health and sustainable transport.

Cell 2.2: Share responsibility / Safe roads		
Partners have clear institutionalised and aligned roles and responsibilities consistent with Safe System outcomes in the design, operation and use of roads.		
Emerging stage	**Advancing stage**	**Mature stage**
Partners recognise their individual roles and the value of cross-disciplinary approaches in reducing crashes. Adjustments to road designs and operational standards achieve agreement between road function and a safe road system.	Understanding of the Safe System is commonplace with a recognition that road-user behaviours are a function of road-design, which is influenced b engineering, design standards, and legislation/transport policies. Safe System policies and practices are aligned, from planning through to operations.	Partners' roles and responsibilities are institutionalised and consistent with Safe System outcomes. Projects, programmes and actions focus on intended speeds and actions to minimise injuries. Priorities for Safe System projects are clear and aligned with related road-infrastructure sectors (e.g. financing, research, land use).

Cell 2.3: Share responsibility / Safe vehicles		
Partners co-operate in the development and implementation of a full set of vehicle regulations, procedures and policies to ensure high safety standards for vehicles and safety equipment.		
Emerging stage	**Advancing stage**	**Mature stage**
Partners, including vehicle manufacturers, importers, regulatory and inspection agencies and users (private and commercial), are aware of their respective responsibilities to ensure all vehicles are roadworthy and meet minimum UN safety standards.	Vehicle manufacturers, importers, regulatory and inspection agencies and users (private and commercial) fully comply with their respective responsibilities to ensure all vehicles are roadworthy and meet the most important UN safety standards. These partners work together to foster innovation and develop, where necessary, new regulations and standards to improve vehicle safety.	Vehicle manufacturers, importers, regulatory and inspection agencies and users (private and commercial) fully comply with their respective responsibilities to ensure all vehicles are roadworthy and meet all relevant UN safety standards. These partners work together to foster further innovation in crashworthiness and crash avoidance. Partners develop, where necessary, new regulations and standards. Partners promote the rapid deployment of the best available technologies to improve vehicle safety, especially for the benefit of vulnerable road users.

Cell 2.4: Share responsibility / Safe speeds		
Partners co-operate to ensure that speed limits are determined based on the functional class and context of the road (particularly vulnerable road-user activity) and that appropriate speed legislation, design, driver education, vehicle technology and enforcement support these limits.		
Emerging stage	**Advancing stage**	**Mature stage**
Partners are aware that road safety requires well-chosen and visible speed limits in agreement with the function and actual use of the road. Strategies to adjust speed limits are developed based on mutual co-operation and agreement. Speed limits are applied and enforced.	Speed limits are aligned with road function; affirmed by legislation, enforcement actions and driver education; and supported by the public. Adjustments to road designs and operations support the varied functions of motorways, highways and urban and residential roads.	Vulnerable road users' functional classes and road uses dictate speeds. The design, construction and maintenance of roads and vehicles support these speeds. Speeds are also supported by vehicle technologies (e.g. intelligent speed-assistance technology). Legislation, enforcement efforts and driver education ensure, to the maximum extent possible, that all road users travel at safe speeds. Procurement contracts include specific safety-related demands to ensure compliance with speed limits.

Cell 2.5: Share responsibility / Safe road users		
Road-user behaviour is within safe limits, due to coherent legislation, education, enforcement, infrastructure, vehicle technology and road-user actions. Transport companies and authorities (e.g. private and public vehicle-fleet owners) have a responsibility to create the conditions for compliance with the rules by their drivers.		
Emerging stage	**Advancing stage**	**Mature stage**
Partners begin to understand the benefits of achieving a positive safety culture through a combination of enforcement and education-awareness campaigns.	Partners recognise that, while road users make poor decisions, human error is dictated by system design. Partners take steps to encourage positive behaviour and reduce the potential for road crashes, and for serious injury when crashes do occur. Behavioural policies focus on specific types of misbehaviour (e.g. impaired driving, failure to wear safety devices, distracted driving and excessive or repeated traffic violations) and on professional drivers. Enforcement methods and efforts to reduce these types of behaviour are developed and adequate. Public safety culture reinforces good safety practices and behaviours.	Road-user behaviour is within safe limits. The best available technology solutions for both vehicle and road systems are in place and support safe road-user behaviour. Legislation, enforcement, education, and road-user actions support these solutions. Relevant legislation focuses on risk mitigation, with repeated violations facing strict and increasing penalties. Transport companies and authorities (including private and public vehicle-fleet owners) have a responsibility to ensure that vehicles – and drivers – comply with the rules. A widely accepted safety culture shared by all road users reinforces the public's zero tolerance for road fatalities.

Cell 2.6: Share responsibility / Safe post-crash care		
Communications systems and appropriate equipment, training and co-ordination allow for immediate and effective application of care, including from first responders, hospitals and trauma centres.		
Emerging stage	**Advancing stage**	**Mature stage**
Partners recognise the importance of trauma care and the need to ensure injured road users receive medical care as quickly as possible to save lives. Post-crash care is available in diverse settings but lacks standardisation and co-ordination.	Emergency and trauma-care systems and plans are in place. Communication occurs between crash sites and emergency response teams. Members of the public can report road crashes via a national emergency number. Emergency responders have standards of first-aid care.	Hospitals, trauma centres and first responders are well organised and capable of responding to the emergency needs of crash victims. Emergency communication systems enable fast application of first aid. Accreditation and formal training in post-crash care delivered through an established network, supported by legislation and appropriate equipment. Good Samaritan laws protect members of the public who provide aid to the injured while waiting for emergency responders to arrive.

Cell 3.1: Strengthen all pillars / Road-safety management		
A detailed understanding of road-safety issues (e.g. causes of fatalities and serious injuries, safety performance indicators) is linked to an integrated, inclusive response based on a multi-sector strategy.		
Emerging stage	**Advancing stage**	**Mature stage**
A holistic approach to road-safety management recognises the complexity and diversity of the causes of crashes and injuries. The various injury-prevention roles of road infrastructure, vehicle technologies, and behaviour modification are integrated in national road-safety strategies and plans.	Road-safety management focuses primarily on co-ordinated and integrated interventions for infrastructure, vehicle technology, speed management, and behaviour modification. Interventions aim to reduce fatalities and serious injuries by offering layers of protection.	The positive interaction of interventions related to infrastructure, vehicle technology, speed management, and behaviour modification drive progress towards a fail-safe system in which crash forces are always within the physical tolerances the human body can withstand.

Cell 3.2: Strengthen all pillars / Safe roads, Safe vehicles, Safe speeds, Safe road users, Safe post-crash care		
Partners recognise how their respective areas function in co-operation with others to deliver Safe System outcomes, and this is reflected in manuals, practices, funding and policies. *These five cells are merged into a single cell, as the key component "Strengthen all pillars" leads to simultaneous safety improvements across all road-safety pillars.*		
Emerging stage	**Advancing stage**	**Mature stage**
Road-safety professionals understand that road safety is a function of the interaction between all pillars of road safety (safe roads, safe vehicles, safe speed, safe road users and post-crash care) and the management of these pillars.	Safety professionals incorporate an understanding of road-safety pillars as best practices and as part of the safety culture. Mechanisms for co-ordination are in place, although complete alignment and institutionalisation between all pillars have not yet occurred.	Partners recognise opportunities for co-operation between their respective areas of expertise. The Safe System approach is a part of each partnership's safety culture. Manuals, practices, funding and policies all call for a Safe System.

Cell 4.1: Prevent exposure to large forces / Road-safety management		
Standards for dealing with the physical elements of the system (and compliance with these standards) play an important role in a programmatic and evolving approach to road-safety management.		
Emerging stage	**Advancing stage**	**Mature stage**
Road-safety management defines standards for the physical elements of the system and trauma care to prevent harm to the body.	The road-safety manager evaluates applied standards for physical elements of the system to reduce harm to the body and applies programmes to disseminate the standards. The road-safety manager takes a programmatic approach to vulnerability problems and rehabilitation.	The road-safety manager's system-wide programmatic approach contains the most effective standards to deal with vulnerability problems in the system. The road-safety manager achieves a high level of compliance with standards for all physical elements of the system and has an integral programmatic approach to rehabilitation.

Cell 4.2: Prevent exposure to large forces / Safe roads		
Human vulnerability for all transport modes dictates the design, operation and use of roads under all circumstances.		
Emerging stage	**Advancing stage**	**Mature stage**
Road design considers human vulnerability via a limited range of devices and solutions. The design of transitions between different road environments do not consider speed differences. Vulnerable road users are sometimes separated from motor vehicle traffic when needed.	Road design accounts for human vulnerability and applies several devices and solutions (e.g. road barriers, medians, speed-reduction measures and roundabouts). Road design is partially consistent with speed limits. VRU are separated from motor vehicle traffic when needed.	All road-design elements take human vulnerability into account for all transport modes. Specifically, design accounts for individual vulnerabilities (i.e. single-vehicle crashes, crashes between cars and powered two-wheelers) and vulnerabilities resulting from interactions (e.g. car-on-car but also interactions between cars and vulnerable road users). Road designs and overall road environments are consistent with speed limits and the function of the road.

Cell 4.3: Prevent exposure to large forces / Safe vehicles		
Vehicles are equipped with systems (active and passive) to protect road users, both inside and outside of the vehicle.		
Emerging stage	**Advancing stage**	**Mature stage**
New vehicles are required to comply with the most important UN vehicle-safety standards. Consumer information encourages a market for safer vehicles. Road-safety partners enforce vehicle-occupancy and load limits, with demonstrated compliance. Mixed-cargo prohibition is strongly enforced.	New registered and second-hand imported vehicles comply with the most important UN vehicle-safety standards. Partners, including but not limited to manufacturers, begin to apply emerging best-available technologies (e.g. autonomous emergency braking) to all passenger and commercial vehicles. All powered two-wheelers capable of speeds of more than 50km/h feature anti-lock brakes and automatic-headlights-on settings. NCAPs rate most new vehicles' crashworthiness performance and crash-avoidance potential. Heavy-goods vehicles are required to be fitted with underrun protection and other passive safety features.	New vehicles are equipped with the best available technologies for crashworthiness and crash avoidance. New vehicles are designed to reduce risk of injury to vulnerable road users. All new vehicles are equipped with intelligent speed assistance. Public- and private-sector fleet procurers are required to purchase five-star and most-highly-rated vehicles tested by NCAPs. The evolution of advanced driving-assistance systems towards greater autonomy is appropriately regulated. Heavy-goods vehicles overloading control policy involves all relevant partners and is co-ordinated with other transport policies.

Cell 4.4: Prevent exposure to large forces / Safe speeds		
Speed limits are set based on human vulnerability and supported by road design, enforcement, driver education and vehicle technologies.		
Emerging stage	**Advancing stage**	**Mature stage**
Speed limits are applied on all roads. There is an ambition to lower speed limits, especially in urban areas with many vulnerable road users. Speed limits are adapted to different vehicle categories (e.g. lower speed limits for trucks, buses and vehicles with trailers).	Speed limits are set according to Safe System principles, taking human vulnerability into account. There is a national goal to achieve Safe System speed limits. For most urban roads with possible conflicts between vulnerable road users and motorised vehicles, a default speed limit of 30 km/h applies. Speed limits above 80 km/h only exist on protected roads (i.e. roads with no possibility of side or frontal impact).	For urban roads with possible conflicts between vulnerable road users and motorised vehicles, a default speed limit of 30 km/h is considered standard. In places where pedestrian activity is prioritised, 20 km/h zones are implemented. Road authorities regularly review speed limits to adapt to changes in the road network. The relationship between speed and public health is recognised and communicated.

Cell 4.5: Prevent exposure to large forces / Safe road users		
Road users are prevented from experiencing large forces by vehicle equipment (including safety equipment such as helmets) and technology, enforcement and infrastructure.		
Emerging stage	**Advancing stage**	**Mature stage**
Helmets for powered two-wheelers, as well as safety belts and child-restraint systems in cars, are obligatory. Consumer-safety information is promoted. Safe routes for cycling and walking are encouraged.	Awareness-raising campaigns focus on negative consequences of speeding and positive effects of motorcycle daytime-running lights. Use of safety belts and child-restraint systems is checked and enforced systematically. Obligatory helmet laws for powered two-wheelers, cyclists and e-scooter drivers are checked and enforced systematically. Protective clothing is obligatory for powered two-wheeler occupants.	Users receive information about protective measures before buying or renting a vehicle. Equipment of vehicles with emerging technologies and according to relevant UN and EU directives is obligatory. Road safety and environmental protection improvements occur due to traffic reduction, increased attractiveness of public transport modes, and autonomic shared vehicles.

Cell 4.6: Prevent exposure to large forces / Safe post-crash care
Aspects related to post-crash care are covered in other cells.

Cell 5.1: Support safe road-user behaviour / Road-safety management		
Analysis of human-centred risks and effective and co-ordinated road-safety intervention programmes prevent (serious) crashes caused by human error. Funding is allocated to support these interventions, which are assessed.		
Emerging stage	**Advancing stage**	**Mature stage**
The management of the road-safety system is conceived from the perspective of the user. Road managers follow up on crash numbers, allocation of funds and policy implementation.	The management of the road-safety system is conceived from the perspective of the user and designed to evaluate interventions and ensure efficacy. It is organised through funding rules and correction mechanisms for system-user errors.	The management of the road-safety system is organised through an institutionalised process of planning, efficiency control and evaluation, and an elaborate mechanism for allocating funding.

Cell 5.2: Support safe road-user behaviour / Safe roads		
The design, operation and use of roads are based on principles to prevent human error, and there is good stakeholder engagement in road-infrastructure projects.		
Emerging stage	**Advancing stage**	**Mature stage**
Road design follows consistent and applicable guidelines. Interventions to prevent human mistakes (e.g. traffic signs, road markings, safety islands, separation, speed humps, footpaths and lighting) are applied. Undesired non-traffic activities (e.g. commercial or social activities) exist alongside and impact high-speed roads.	Road design follows consistent and applicable standards. Road-safety audits and inspections are systematically applied to road design and built roads. Road characteristics vary according to the road hierarchy, and self-explaining roads and forgiving concepts are applied. Efforts are made to improve the social consensus on the desirable use of the road space.	The design of roads is upgraded so that all new roads are built according to Safe System principles. Interventions to prevent human mistakes on the roads are widely applied. Safe route choices are facilitated by intelligent transport systems. There is a social consensus on the desirable use of the road space. There is a high level of maintenance on the roads.

Cell 5.3: Support safe road-user behaviour / Safe vehicles		
Active-vehicle systems are included in motor vehicles, providing high levels of road-user protection. Safety standards for bicycles (i.e. for brakes, helmets, lights) are in place.		
Emerging stage	**Advancing stage**	**Mature stage**
The most important UN regulations on vehicles and vehicle inspections are mandatory for new and imported second-hand vehicles. These regulations, combined with consumer information, help establish a minimum safety guarantee.	New and second-hand imported cars and motorcycles are required to meet the UN's most important vehicle-safety standards, including antilock braking systems for motorcycles and electronic stability control for commercial vehicles and passenger cars. Vehicle inspections are systematic, regular and strictly enforced throughout the territory in which they apply. Mandatory safety labelling encourages buyers to purchase vehicles with the highest NCAP safety ratings.	The best available advanced driver-assistance technologies (e.g. autonomous emergency braking, lane-departure warning, seat-belt alerts and intelligent speed assistance) are common in cars, buses and heavy-goods vehicles. Technologies to prevent impaired driving (e.g. alcohol interlocks), distraction and drowsiness (e.g. driver-status monitoring) are applied. Fiscal and other incentives encourage rapid deployment of newly developed, best-available technologies. Procurement of public and commercial fleets is benchmarked at five-star or highest ratings by NCAPs. High-quality vehicle maintenance occurs at every stage of a vehicle's life cycle.

Cell 5.4: Support safe road-user behaviour / Safe speeds		
Safe and credible speed limits are set, aiming at the natural acceptance of these limits and supported by road design, enforcement, driver education and vehicle technologies.		
Emerging stage	**Advancing stage**	**Mature stage**
Speed limits are clearly signed and communicated. Enforcement strategies for speeding (e.g. a penalty-point system or fines) are in place. Agencies authorised to set speed limits have a responsibility to inform and educate the public and road users of the risks associated with speeds and speeding.	A clear road hierarchy separates roads with flow functions and higher speed demands from roads with access functions and lower speed demands. Speed limits for different road categories are self-explaining. The speed enforcement system is systematic, structured and highly visible. Speed-enforcement interventions employ a combination of manual and automatic techniques and there is a low tolerance for speeding.	Advanced speed-management systems (e.g. intelligent speed adaptation and geo-fencing) are widespread. Businesses, governments and other fleet owners practice a zero-tolerance approach to speeding in their own transport operations, as well as in the operations of fleets they have procured. Governments co-operate with other sectors to communicate benefits of lower speeds (e.g. reduced emissions and improved physical wellbeing).

Cell 5.5: Support safe road-user behaviour / Safe road users		
Road-user errors are prevented through provision of knowledge on road-user requirements, and this is supported by vehicle technology, enforcement and infrastructure.		
Emerging stage	**Advancing stage**	**Mature stage**
Road users possess a general knowledge of the most critical road-safety issues (e.g. speed, alcohol and seat belts) and regulations on these issues are enforced. Driving courses are obligatory for all motor-vehicle types. A national driving code includes traffic rules, penalties for offenders, random blood-alcohol tests and enforcement of drink-driving regulations. Traffic fines are in accordance with legislation and paid and processed by honest police officers.	Effective enforcement of safety rules occurs via a well-organised enforcement strategy and deterrent punishment for offenders. A national road-safety education system commences at the primary-school level, including instruction on the main first-aid rules and driving licenses for bicycle and e-scooter users. National teaching programmes and training systems exist (depending on the license type) for all driving schools, special courses and fit-to-drive tests for all professional drivers. Light reflectors for pedestrians and cyclists in rural areas are obligatory at night.	Safety rules benefit from efficient enforcement policies and strategies, which evolve with the appearance of new traffic offences. The enforcement apparatus is adaptable to new challenges. Training and information on new technologies increase road users' safety. Distraction is prevented through appropriate interventions. Automatic, on-board checking of fit-to-drive capabilities (e.g. absence of alcohol and drugs, and alcohol-ignition interlocks for drink-driving offenders) is obligatory. A smart eco-travel planning system promotes non-motor mobility, public transport, environmentally friendly powered vehicles and safest routes.

Cell 5.6: Support safe road-user behaviour / Safe post-crash care
Aspects related to post-crash care are covered in other cells.

Annex B. List of case studies

This Annex provides summaries of the 17 completed case studies analysed by the Working Group. The full set of case studies is available on the ITF website: https://www.itf-oecd.org/safe-system-approach-action.

Title	Description	Themes
Africa		
The Trauma-Ouaga Project, Burkina Faso	This project addressed the need for co-ordination between police and hospital data. In a first pilot, tracers were installed in police cars reporting crashes in Ouagadougou. A second pilot aimed to follow up on injured road-crash victims. The data have been used to create crash maps and gain a better idea of the number and severity of road crashes.	Road-crash data Partners Post-crash care
Road-safety management and capacity building in Cameroon	This case study relates to three road-safety initiatives financed by multilateral organisations in Cameroon between 2015 and 2019. The initiatives sought to address the poor quality of road-crash data, the lack of knowledge on road safety, and the lack of co-operation in road-safety management.	Road-crash data
The SARSAI programme in sub-Saharan Africa	The School Area Road Safety Assessments and Improvements (SARSAI) programme includes measures to separate children from traffic and reduce vehicle speeds to 30 km/h or less in areas where children walk to school. The method has been implemented in over 50 high-risk school areas.	Pedestrian and child safety
Asia		
Highway improvements in Karnataka State, India	The second Karnataka State Highway Improvement Project (KSHIP-II) is a partnership between Karnataka state and the World Bank to improve the core road network. The project identified safe demonstration corridors to show how targeted improvements can improve safety. It emphasised a whole-of-government approach to road safety.	Speed management Safety performance indicators (SPIs) Infrastructure interventions
Evaluating municipal road safety performance indicators in Korea	Fatalities on local-government roads account for more than 70% of total road fatalities in Korea. The Korean Transport Institute reviewed local-government road-safety management systems using safety SPIs. In total, 24 SPIs were developed, and they are now applied in 17 local government areas, which now use SPIs to allocate funds and staff to road safety.	SPIs Local-government interventions

Title	Description	Themes
The Slow Zones, Safe Zones programme in Pleiku City, Viet Nam	The Slow Zones, Safe Zones programme improved the safety of vulnerable communities near two schools through road modifications and a public-awareness campaign. This led to reduced speed limits near schools at opening and closing times. Partners also acknowledged the need to introduce legislation to develop school zones in Pleiku City, Viet Nam.	Speed management Infrastructure interventions Pedestrian and child safety Partners
The New Car Assessment Program for Southeast Asian Countries	The ASEAN New Car Assessment Program aims to improve vehicle safety standards, build a market for safer vehicles and raise consumer awareness. Several manufacturers have worked with ASEAN NCAP to ensure they meet all requirements by including important and improved vehicle-safety features in their soon-to-be-released models.	Fleet safety SPIs
Latin America		
The Speed Management Programme in Bogotá, Colombia	In 2017, Bogotá officially adopted Vision Zero, underpinned by Safe System principles. The city implemented 50 km/h speed limits for arterial roads and 30 km/h zones near schools. The plan also involved developing safe designs for vulnerable road users, including road reconfigurations to manage safe speeds and provide shelter for pedestrians and cyclists.	Speed management Infrastructure interventions Pedestrian and child safety Partners Local-government interventions
Vision Zero for Youth in Mexico City	The vast majority of child road deaths occur during the walk to or from school. In 2017–18, the Institute for Transportation and Development Policy piloted Vision Zero for Youth at a public middle school in the borough of Cuauhtémoc in Mexico City. The project engaged with parents, teachers, students and local authorities to build support for road-safety actions.	Speed management Infrastructure interventions Pedestrian and child safety Partners Local-government interventions
Europe		
Introducing a universal call and dispatch number in Georgia	Until 2012, co-ordination between actors relevant to post-crash response in Georgia was poor. In 2012, a single emergency number (112) was launched. Then, in 2016, a joint operations centre installed CCTV cameras across the country. These actions enabled incident monitoring, evaluation of post-crash responses, and analysis of police unit activities.	Post-crash care
Improving post-crash capacity in Moldova	To address the limited capacity of Moldova's fire service to respond to road crashes, a British charity provided it with vehicles, essential rescue and medical equipment, and up-to-date training. The aim was to enable the emergency services to improve response times and reduce road-traffic fatalities.	Post-crash care
Sustainable Safety in the Netherlands	The Netherlands' Sustainable Safety strategy is built on co-operation between road authorities (national, provincial, municipal), the public and elected officials, and a steering group. While the focus is on vulnerable road users, Sustainable Safety embraces the different functions expected from a Safe System approach.	Road-safety strategies Infrastructure interventions

Title	Description	Themes
Improving pedestrian safety in województwo małopolskie, Poland	Recognising that pedestrians are at most risk at pedestrian crossings, the region of Małopolska illuminated crossings and improved road markings. In addition, speed limits were reduced to 50km/h at crossings on regional and national roads. The transformation of the Małopolska Voivodship Road Safety Council from an advisory body to an active unit with a dedicated budget was crucial to the project's success.	Speed management Infrastructure interventions Pedestrian and child safety
Oceania		
The creation of the Office of Road Safety, Australia	Australia adopted the Safe System approach at the federal level in 2004. Efforts to address road trauma have led to sophisticated governance structures, and significant Safe System successes, notably at the state level. This case study describes how a more fully integrated system was achieved by creating a federal-level lead agency for road safety.	Road-safety strategies
Safe System Assessments in New Zealand	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. 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.	SPIs Infrastructure interventions
North America		
The Caltrans Pedestrian Safety Improvement Program	California has embraced the Safe System approach since 2019. In this programme, the transport authority (Caltrans) addresses serious pedestrian injuries and fatalities before they occur 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.	Pedestrian and child safety Road-crash data Infrastructure interventions
Private sector		
The Logitrans approach to road safety	Argos is a Colombian cement company active in 15 Latin American countries, with logistics and transport provided by a subsidiary, Logitrans. Logitrans has adopted a systemic approach to road safety. Its multiannual road-safety plan addresses the pillars of the Safe System approach, and it has also set speed limits for subcontracting drivers.	Speed management Road-safety strategies Road-crash data Partners Fleet safety

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International Transport Forum

The Safe System Approach in Action

Road crashes kill over 1.3 million people worldwide each year and seriously injure millions more. The Safe System approach to road safety can drastically reduce road deaths – but how can it be put into action? Building on the deliberations of a joint ITF–World Bank Working Group, this report proposes a framework for designing, implementing and assessing projects with a Safe System focus. In addition, it draws on lessons from real-world case studies to offer guidance on implementing Safe System interventions.

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