International Transport Forum

Using Safety Performance Indicators to Improve Road Safety

The case of Korea

Case-Specific Policy Analysis

Using Safety Performance Indicators to Improve Road Safety

The case of Korea

Case-Specific Policy Analysis

The International Transport Forum

The International Transport Forum is an intergovernmental organisation with 66 member countries. It acts as a think tank for transport policy and organises the Annual Summit of transport ministers. ITF is the only global body that covers all transport modes. The ITF is politically autonomous and administratively integrated with the OECD.

The ITF works for transport policies that improve peoples' lives. Our mission is to foster a deeper understanding of the role of transport in economic growth, environmental sustainability and social inclusion and to raise the public profile of transport policy.

The ITF organises global dialogue for better transport. We act as a platform for discussion and pre-negotiation of policy issues across all transport modes. We analyse trends, share knowledge and promote exchange among transport decision makers and civil society. The ITF's Annual Summit is the world's largest gathering of transport ministers and the leading global platform for dialogue on transport policy.

The Members of the Forum are: Albania, Armenia, Argentina, Australia, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Brazil, Bulgaria, Cambodia, Canada, Chile, China (People's Republic of), Colombia, Costa Rica, Croatia, Czechia, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, India, Ireland, Israel, Italy, Japan, Kazakhstan, Korea, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Mexico, Republic of Moldova, Mongolia, Montenegro, Morocco, the Netherlands, New Zealand, North Macedonia, Norway, Poland, Portugal, Romania, Russian Federation, Serbia, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Tunisia, Türkiye, Ukraine, the United Arab Emirates, the United Kingdom, the United States and Uzbekistan.

International Transport Forum
2 rue André Pascal
F-75775 Paris Cedex 16
contact@itf-oecd.org
www.itf-oecd.org

Case-Specific Policy Analysis Reports

Cite this work as: ITF (2023), "Using Safety Performance Indicators to Improve Road Safety: The Case of Korea", *International Transport Forum Policy Papers*, No. 126, OECD Publishing, Paris.

Acknowledgements

This report was written by Vatsalya Sohu and Xiaotong Zhang of the International Transport Forum (ITF). At the ITF, Vatsalya Sohu co-ordinated the project. Veronique Feypell, Rachele Poggi and Elisabeth Windisch provided valuable comments and guidance. Hilary Gaboriau and David Prater provided editorial support.

The report is informed by desk research and contributions and insights that emerged during expert interviews with Anna Vadeby (Swedish National Road and Transport Research Institute), David Shelton (Asian Development Bank), Dominique Mignon (Université Gustave Eiffel), George Yannis (National Technical University of Athens), Guro Ranes (Norwegian Public Roads Administration), Henk Stipdonk (Netherlands Institute for Transport Policy Analysis, KiM), James Bradford (International Road Assessment Programme), Juris Kreicbergs (Riga Technical University), Milen Markov (State Road Safety Agency, Bulgaria), Nahn Tran (World Health Organization), Peter Silverans (Vias Institute), Peter Whitten (Directorate General for Mobility and Transport, European Commission) and Wouter Van Den Berghe (Institute for Road Safety Research, SWOV).

The authors would also like to thank Anna Vadeby, David Shelton, Dominique Mignon, George Yannis, Henk Stipdonk and Wouter Van Den Berghe for their feedback and insightful comments, which were extremely helpful in refining the report.

This report was made possible by funding from the Korea Transportation Safety Authority (KOTSA). The ITF would like to thank Saerona Choi (KOTSA) for her valuable input and support throughout this project.

Table of contents

Figures

Tables

Boxes

Executive summary

Key messages

Set safety targets

Ambitious road safety targets and concrete measures help to reduce the number of road fatalities and injuries quickly. Including meaningful performance indicators in road safety strategies is crucial to success.

Prioritise vulnerable people

Pedestrians, cyclists and the elderly are most vulnerable in road traffic. Prioritise their safety by using road safety performance indicators to pave the way for more inclusive, protective road environments and reduce the risk of road traffic causing tragedies.

Create a feedback loop

The insights gained from safety performance indicators must feed directly into improving road safety strategies. Creating a continuous feedback loop will make the strategies responsive to changes, measures more impactful and road traffic safer.

Main findings

Safety performance indicators can play a critical role in implementing the Safe System approach to road safety. They delve into the causes of crashes and help track progress, enabling process-oriented interventions that address various road-safety issues and reduce road users' risk of death or serious injury.

Developing safety performance indicators involves identifying and prioritising policy areas, selecting relevant indicators, continuously monitoring and evaluating progress, and aligning selected indicators with national road safety strategies. Regular monitoring, realistic target setting, and the flexibility to update and introduce new indicators are crucial.

Over the last decade, Korea has reduced road fatalities by roughly 50%. Various Korean ministries and agencies are actively working to improve road safety. They have set ambitious targets to reduce road fatalities further, focusing on vulnerable groups.

This report emphasises the importance of using safety performance indicators to complement traditional statistics and current road safety strategies for a more comprehensive understanding of road safety. While the report identifies indicators that may be appropriate in the Korean context, its findings will be relevant for other countries looking to deploy safety performance indicators in the future.

The report's findings emphasise the critical role of adequate road safety data and standardised methodologies in developing safety performance indicators for road safety management. Specifically, any data used in developing and maintaining indicators should be available, accessible, trustworthy, comparable, stable, simple, and aligned with safety objectives.

Moreover, international co-operation and benchmarking are vital for assessing and benchmarking road safety on a global scale. The European Commission's Baseline and Trendline projects exemplify the importance of standardised methodologies in collecting harmonised road safety data, offering methodological guidelines for key performance indicators.

When deploying SPIs in Korea, vulnerable road users (pedestrians, cyclists, and motorcyclists) and older people, who are at a higher risk, should be a priority. The report provides specific indicators for monitoring and addressing major risk factors, especially for but not limited to these groups. Finally, it stresses the importance of embedding SPIs into the policy formulation process, ensuring that they are considered from the outset and inform decision-making at every stage.

Road-safety policies and programmes should have mechanisms for collecting evidence to feed into the policy formulation process. Long-term thinking is also encouraged, with the need to set ambitious but feasible goals. Integrating SPIs into national road safety strategies and periodically reviewing and redefining these strategies is essential for long-term and sustained road safety improvements.

Top recommendations

Adopt safety performance indicators to gain deeper insights into road-safety challenges

Embracing a comprehensive and proactive approach to road safety management is crucial for improving road safety outcomes. Traditional road safety indicators often focus on the outcomes of crashes (e.g. fatalities and injuries) without delving into their underlying causes. Policy makers can design targeted interventions to address the root causes of crashes and injuries by using safety performance indicators to analyse traffic and transport systems. Recognising the imperative for SPIs involves a shift from solely relying on traditional indicators to embracing a more comprehensive and proactive approach to road safety management. This shift is crucial for improving road safety outcomes.

Incorporate safety performance indicators in long-term national road safety strategies

Establishing a solid connection between safety performance indicators and a well-defined political vision is important for improving road-safety efforts. It ensures the effective alignment of selected indicators with overarching road safety strategies. It also facilitates a deeper comprehension of the specific goals and objectives that support the pursuit of safer roads. Policy makers should adopt a forward-thinking approach to road safety by setting ambitious, achievable long-term targets. Safety performance indicators should reflect these long-term objectives and undergo periodic review and refinement.

Identify and prioritise road-safety focus areas that reflect local circumstances

Road-safety challenges vary by context. Pedestrians in countries with harsh winters are vulnerable when navigating dark conditions, while those in tropical regions face challenges related to heavy rainfall, flooding and high temperatures. Identifying priority areas based on local contexts (and data) ensures maximum impact. Authorities can start by introducing behavioural indicators (e.g. speeding, drink-driving, seat belt and helmet use, and distractions), which have well-documented causal links to road crashes and their severity. Subsequent actions can then address road infrastructure, vehicle safety and post-crash care.

Deploy tailored safety performance indicators for at-risk groups

Identifying specific at-risk user groups and deploying safety performance indicators to improve their specific road-safety outcomes can accelerate the improvement of overall road safety in a given context. In Korea, vulnerable road users (including pedestrians, cyclists, motorcyclists and older people) make up over half of the road fatalities. Indicators designed to help measure and monitor these groups' risks can benefit all road users in the long term.

Introduce comprehensive data collection guidelines and maintain methodological consistency

Comprehensive data collection guidelines should guide the development of safety performance indicators. Standardised methodologies and definitions ensure consistency and comparability in data collection and analysis. The data itself must be accurate, reliable, and validated to maintain integrity. Moreover, efforts should continue to enhance data collection methods and promote collaboration among relevant agencies to ensure direct and reliable data availability.

Use safety performance indicators to monitor road-safety progress regularly

Monitoring safety performance indicators helps assess the effectiveness of policies and make necessary adjustments. There should be a clear link between an indicator and the safety-enhancing potential of the specific condition it measures. Acknowledging that some indicators cannot be set in stone as the transport sector constantly evolves is essential.

Establish clear targets and implement a robust mechanism to integrate safety performance indicators in the policy-formulation process

Once safety performance indicators have been developed, ensuring that the results and analyses derived from these indicators are effectively integrated into current and future policy measures is vital. SPIs should be accompanied by clear targets, both medium- and long-term. This ensures that SPIs are seamlessly integrated into the policy formulation process from the outset. An SPI that fails to contribute to policy measures risks wasting valuable resources, as it may not drive the necessary actions and interventions needed to address safety concerns effectively.

Road safety and safety performance indicators

Every year, about 1.3 million people lose their lives to road traffic injuries, the tenth leading cause of death globally (WHO, 2021b). In 2020, the United Nations General Assembly adopted a resolution on "Improving Global Road Safety" (UN, 2020). Through this resolution, governments reaffirmed their commitment to the 2030 Agenda for Sustainable Development, proclaimed the period 2021-2030 as the Decade of Action for Road Safety, and established a target to reduce by at least 50% the number of road traffic deaths and injuries by 2030. In 2022, the UN General Assembly unanimously adopted a political declaration on improving global road safety, committing to a range of actions to reduce road traffic deaths by at least 50% by 2030 (UN, 2022). The General Assembly has committed to implementing the Safe System approach by adopting the declaration.

The Safe System approach to road safety

The traditional approach to road safety aimed to understand the causes of a crash and then suggest how to avoid them. The Safe System approach, by contrast, is centred on preventing injuries by accommodating human error; it advocates for the road system to be planned, designed and operated to be forgiving of inevitable human error (ITF, 2022). This contradicts the traditional approach to road safety, which puts the driver as the cause of all road traffic crashes.

The Safe System approach is a proactive approach to road safety (EC, 2022b). It is preventive and starts with the idea that humans are flawed, and their mistakes can lead to road crashes. It aims to target and treat risks holistically in the transport system proactively.

The World Health Organization, the European Union, and several other countries have adopted the Safe System approach as the best way to eliminate road traffic deaths and serious injuries. Several countries, including the Netherlands and Sweden, first adopted this approach by promoting a combination of interventions for road safety.

In the Netherlands, its origins lie with the Sustainable Safety programme in the 1990s. Sweden's engagement with the Safe System started with its Vision Zero programme. Both programmes included stricter enforcement, safer roads and roadside designs, improved and secure vehicle technologies and better post-crash response.

These approaches focused on implementing measures in the transport system to prevent crashes from resulting in fatalities and serious injuries. Several other countries in the EU, as well as Australia and New Zealand, have since adopted the Safe System approach (ITF, 2022b).

The four original guiding principles of the Safe System approach are as follows (ITF, 2016):

1. People make mistakes that can lead to road crashes. The transport system needs to acknowledge this first rather than trying only to correct it.
2. The human body has a definite, limited physical ability to absorb crash forces before harm occurs.

3. Shared responsibility for road safety exists amongst those who design, build, manage and use roads and vehicles and provide post-crash care to prevent crashes resulting in serious injury or death. All involved are responsible for respecting the road traffic laws and observing caution.
4. All parts of the system must be strengthened to multiply their effects. It is essential to ensure that all road users are still protected even if one part of the system fails.

The Safe System approach aspires to achieve zero fatalities and serious injuries from road crashes. It relies on these principles to design and operate a road transport system to eliminate road deaths and serious traffic injuries. In 2022, the ITF added a fifth overriding principle: "Establish robust institutional governance". This principle reflects the need to create "permanent institutions to organise government, covering research, funding, legislation, regulation and licencing and to maintain a focus on delivering improved road safety as a matter of national priority" (ITF, 2022b).

The Safe System framework outlined by the ITF (2022b) is a three-dimensional theoretical framework that provides guidelines for implementing the Safe System approach. It consists of:

1. the five principles (now called key components) of the Safe System
2. the Global Plan for the Decade of Action for Road Safety's five pillars of road safety (WHO, 2021a): road safety management, safer roads and mobility, safer vehicles, safer road users and post-crash response, plus an additional pillar on safe speeds (ITF, 2022)
3. the five stages of development of Safe System interventions, ranging from no Safe System context or knowledge (starting stage) through to zero fatalities and zero serious injuries (perfect stage).

This three-dimensional framework helps policy makers guide road-safety policies towards a Safe System while providing them with tools to map their progress. An active ITF Working Group is further developing the Safe System framework, intending to create an accessible online tool that road-safety authorities and other actors can use to help further develop Safe System interventions in their specific contexts (ITF, n.d.).

Why use safety performance indicators for road safety?

The ETSC (2001) defined a safety performance indicator (SPI) as "any measurement that is causally related to crashes or injuries, used in addition to a count of crashes or injuries to indicate safety performance or understand the process that leads to accidents". SPIs can help track progress towards the implementation of the Safe System. Once national or regional road safety programmes set road-safety targets, they must complement them with SPIs to observe trends over time and identify appropriate interventions to improve road safety further.

Traditionally, road-safety authorities have calculated the frequency and socio-economic costs of road crashes and injuries to assess the safety of transport systems. However, such indicators are incomplete as they do not investigate the cause of crashes. Random fluctuations can also change the frequency of crashes. SPIs, by contrast, can give a more holistic picture of the safety performance of a transport system and identify the safety issues that lead to road crashes. Regular and long-term recording and monitoring of SPIs can help better understand the processes that lead to crashes. This understanding, in turn, can facilitate the identification of targeted interventions to bring positive change.

Once a road safety programme has been rolled out and targets set, SPIs are needed to track the programme's progress. They can also help implement process-oriented road safety interventions catering to a broader range of public policy instruments (Bemelmans-Videc, Rist and Vedung, 2017).

SPIs must focus not only on reducing deaths and serious injuries due to crashes but also on the intermediate outcome: the operational conditions of the traffic system that lead to crashes (Hakkert, Gitelman and Vis, 2007). Unsafe operating conditions within a traffic system can relate to the pre-crash, crash or post-crash period. Different measures may be needed during each of these periods. For example, crash-prevention measures are most relevant in the pre-crash period, while injury-prevention measures generally apply in the crash or post-crash periods.

SPIs can also help measure a policy intervention’s output or impact. For example, in the area of drink driving, the intermediate outcome could be the number of people driving under the influence of alcohol. The policy intervention’s output could be the number of random breath tests carried out.

Table 1 describes a model of road-safety management developed by Hakkert, Gitelman and Vis (2007). At the top is the social (i.e. monetary) cost. In the above example, this would be the monetary cost of serious injuries and fatalities from crashes caused by driving under the influence of alcohol. The road safety interventions in this example could be enforcement by police and public education through random breath tests and awareness campaigns, respectively. Several interventions might tackle one risk factor.

The interventions in this example will reduce the risk of crashes due to drink driving in different ways. Ideally, the SPI used must reflect changes in both. In other words, the SPI must express the scope of the problem rather than the scale of interventions needed to treat the problem. It must be able to measure the unsafe operation condition, which is impaired driving due to being under the influence of alcohol.

The table refines the model Hakkert, Gitelman and Vis (2007) described by adding a final layer of legislation necessary to ensure effective enforcement. An example of an SPI that measures this could be the percentage of drivers driving within the legal limit for blood-alcohol concentration (BAC).

Table 1. Example of a road safety management model for risk due to drink driving

Model segment	Example	
Social cost	The social cost of crashes due to driving under the influence of alcohol	
Final outcome	Deaths and serious injuries from crashes due to driving under the influence of alcohol	
Operational conditions	Impaired driving due to the driver being under the influence of alcohol	
Output	Number of random breath tests	Public awareness campaigns
Road safety intervention	Enforcement	Public education
Legislation	Blood-alcohol content levels stipulated by law	

Source: Derived from Hakkert, Gitelman and Vis (2007).

Based on research and documented evidence, the first step in setting up an SPI is identifying a causal relationship between a road safety problem and road crashes that lead to serious injuries or deaths. Countries and cities have different contexts, meaning causal relationships can differ. The next step is to turn the road safety problem into a safety performance indicator. Then, a measuring system that outlines the frequency and method of measurement of the selected SPI must be defined.

It is important to note that collecting and processing sufficient quality data harmoniously is a prerequisite for using SPIs (Gitelman et al., 2014). The values of each SPI should be consistent – that is, higher values for SPIs should correspond to a better system's performance (Hakkert, Gitelman and Vis, 2007). An ideal SPI reflects safety rather than unsafety, defined on a scale of 0 to 1, where 0 represents no safety, and 1 illustrates perfect safety. For example, an SPI could be "90% of all car drivers wear seatbelts".

These indicators should represent safety performance and progress in improving road safety. Figure 1 briefly summarises the process from start to finish. As a starting point, SPIs connect safety risks with measures taken to address them. These measures further improve the SPIs, which must be closely monitored and compared to predefined safety goals. If SPIs don't meet these goals, policies can be adapted to further enhance road-safety performance.

Figure 1. Safety performance indicators: Concept and process

Source: ITF.

SPIs can be designed for any identified road safety risk. In a city or country where cycling is a prevalent mode of transport, a risk-reducing SPI could be the proportion of dedicated bike lanes on or along streets. With long-term monitoring of such an SPI, the authorities can track progress towards enhancing the safety of bicycle users. Trends identified while tracking the SPI can also help identify interventions and measures to improve it.

Different types of safety performance indicators

The first step in the process of developing an SPI must be the definition of a problem. This means defining the unsafe operational condition that needs to be addressed (Hakkert, Gitelman and Vis, 2007). SPIs must be defined and chosen to cover all elements of the Safe System.

Different areas of road-safety management impact the overall safety performance. When there is a strong relationship between an SPI and crash occurrence – in other words, when the SPI contributes strongly to crashes and thus deaths and serious injuries – then this SPI has higher importance than others. Behavioural indicators such as speeding, drink-driving and seat-belt use are the most common to begin with due to the relative ease of implementing interventions in these areas to counter risks. Subsequently, most methodologies propose and agree on the importance of SPIS for alcohol and drug use, speeding, distraction, protective gear, restraint systems, vehicle safety, post-crash care, infrastructure, and daytime running lights (Silverans and Vanhove, 2023).

Most countries face a combination of road-safety issues in these areas. Statistics compiled by the WHO (2022) on their impact on road crashes and injuries suggest that speeding is one of the most prominent issues. According to the WHO (2022), increases in average speed lead to increases in the likelihood and severity of crashes. With drink-driving, the risk of road crashes starts with low BAC, and a significant increase occurs when BAC is more or equal to 0.04 grams per decilitre (WHO, 2022). Correct usage of helmets can reduce the risk of fatal injuries and risk of head injuries for motorcyclists by 42% and 69%, respectively (Liu et al., 2008). Drivers using their mobile phones while driving are roughly four times more likely to be involved in a traffic crash than those not using their phones (WHO, 2018a). These causal relationships are well documented, but there are several other risk areas where SPIs are relevant.

European countries such as Norway and Sweden were early adopters of SPIs. These countries use SPIs in their targeted road safety programmes and are among the best-performing countries in terms of road safety. Table 2 shows common target areas and corresponding SPIs for different countries and regions. The SPIs listed for the EU derive from the recently published findings of the Baseline project, which aims to produce values for road safety key performance indicators (KPIs) in EU Member States (Silverans and Vanhove, 2023).

Table 2. Safety performance indicators in different countries and regions for select target areas

Target area	European Union (baseline)	Sweden	Norway	New Zealand
Speeding	Percentage of vehicles travelling within the speed limit	Percentage of traffic volume within speed limits, national and municipal road network (Average) journey speed	Percentage of vehicles complying with the speed limit	Percentage of vehicle-kilometres travelled (VKT) on roads with speed limit above 80km/h that have a median barrier Percentage of traffic travelling within speed limits (by rural, urban and urban centres) Mean speed of vehicles (by rural, urban and urban centres)
Drink driving	Percentage of drivers driving within the legal limit for blood-alcohol concentration (BAC)	Percentage of traffic volume with sober drivers	Percentage of traffic performance involving drivers intoxicated at a level corresponding to a BAC of 0.02 % or higher	Percentage of drivers impaired by alcohol
Safety belts	Percentage of vehicle occupants using the seat belts correctly	Percentage of front seat passenger car occupants wearing a seat belt	Percentage of all drivers and front-seat passengers in light vehicles of heavy goods vehicles wearing seat belts	Percentage of car occupants using a seatbelt
Child restraint systems	Percentage of vehicle occupants using the child restraint system correctly		Percentage of all children aged 1-3 secured facing the rear when seated in a car Percentage of all children aged 1-8 secured correctly when seated in a car	Percentage of car occupants using a child restraint
Protective equipment	Percentage of riders of powered two wheelers and bicycles wearing a protective helmet Percentage of riders wearing a helmet, separately for users of bikes and powered two wheelers	Percentage of observed cyclists and moped riders wearing a helmet	Percentage of cyclists wearing bicycle helmets Percentage of pedestrians wearing safety reflectors on lit roads during dark hours	
Distraction	Percentage of drivers not using a handheld mobile device		Number of accidents caused by inattention due to distraction	Percentage of drivers using handheld cell phones while driving
Post-crash care	Time elapsed between the emergency call following a collision			

	resulting in personal injury and the arrival at the scene of the collision of the emergency services			
Vehicle safety	Percentage of passenger cars with a European New Car Assessment Programme (Euro NCAP) safety rating equal or above a threshold	Percentage of new passenger cars sold with a 5-star Euro NCAP rating	Percentage of cars with autonomous emergency braking (AEB) Percentage of cars with lane departure warning Percentage of cars with autonomous emergency braking to prevent collisions with pedestrians and cyclists (pedestrian AEB)	Percentage of the vehicle fleet with a high safety rating Percentage of the general public understand vehicle safety information Percentage of the general public who agree that it is important to have a vehicle that has a high safety rating Percentage of motorcycles over 125 cc fitted with anti-lock braking systems (ABS)

Sources: Baseline: Silverans and Vanhove (2023); Sweden: Hurtig et al. (2022); Norway: Norwegian Public Roads Administration (2018), Norwegian Public Roads Administration (2022); New Zealand: New Zealand Government (2020).

The Trendline project (Trendline, n.d.) builds on the Baseline project. It has identified 10 new experimental and complementary indicators and will develop appropriate methodologies and test them on a limited scale. The indicators include driving under the influence of drugs, share of 30km/h road lane lengths in urban zones, red-light negations by road users, compliance with traffic rules at intersections, helmet wearing of personal mobility device riders, self-reported risky behaviour, attitudes towards risky behaviour, use of lights by cyclists in the dark, enforcement of traffic regulations and alternative speeding indicators (Trendline, n.d.).

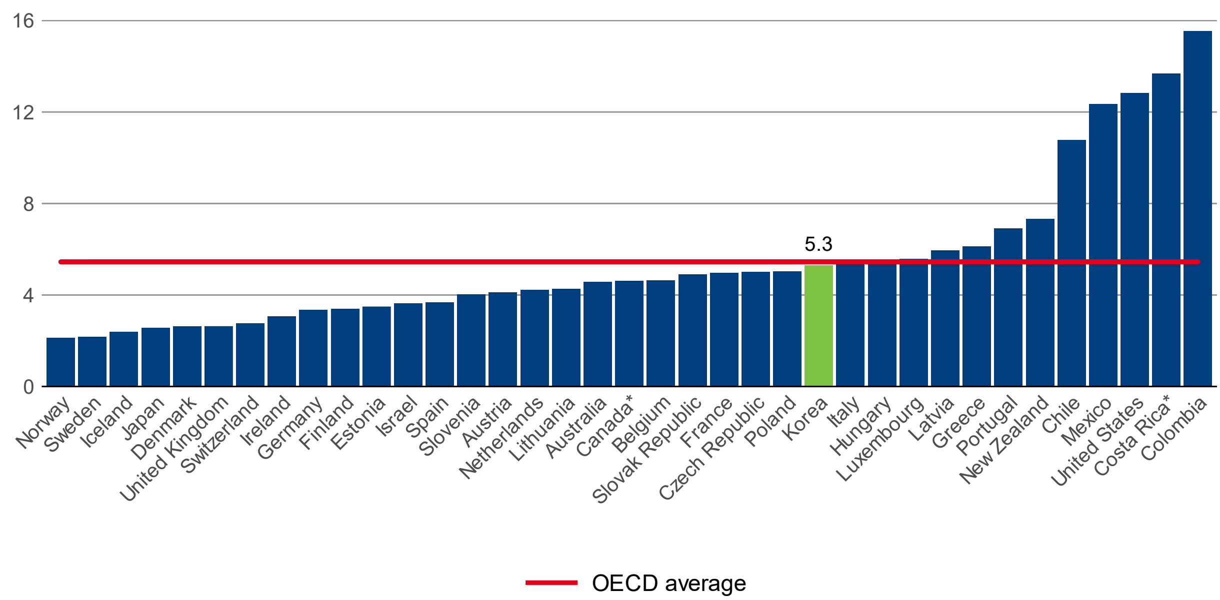
These SPIs comprise a powerful tool for planning, monitoring and evaluating road-safety progress. They echo the road transport system conditions that impact safety performance. They help describe the safety conditions and monitor the effect that interventions have on the safety performance of the road transport system.

However, this is not to suggest that SPIs alone are sufficient to monitor progress in achieving road safety goals. A later chapter of this report provides examples of road-safety indicators that are not SPIs (as defined in this section). Road-safety authorities may use these indicators to supplement SPIs and track progress towards road-safety targets.

Korea's current road-safety landscape

Korea has achieved a significant reduction in road fatalities over the last decade. Road fatalities have reduced by nearly 50%, from 5 392 deaths in 2012 to 2 735 in 2022. However, Korea still has a long way to go regarding its road-safety performance compared to other OECD countries (see Figure 2). Although Korea's road fatality rate falls below the global average of 5.4 per 100 000 inhabitants, it falls within the mid-range compared to all OECD countries, with Norway and Sweden having lower rates of 2.1 and 2.2, respectively.

Figure 2. Road fatalities per 100 000 inhabitants, OECD countries, 2022

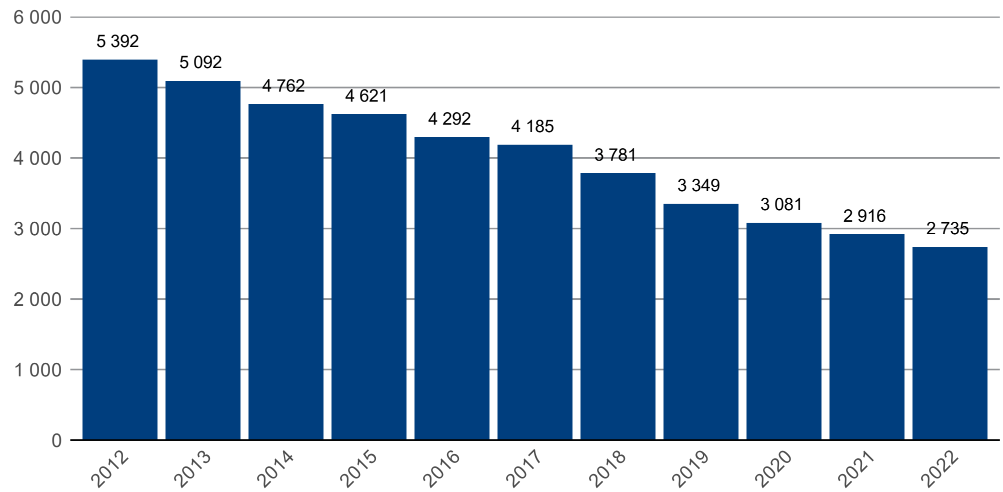


Note: * denotes 2021 data. The data from Türkiye is excluded as it has not been validated by IRTAD.
Source: ITF/IRTAD data.

The Korean authorities have been taking active steps towards improving road safety, aiming to achieve zero fatalities and serious injuries. Several ministries and agencies have been working to develop a holistic approach to road safety in Korea. These include the Korea Transportation Safety Authority (KOTSA), the Korea Road Traffic Authority (KoROAD), the Korea Transport Institute (KOTI), the Ministry of Land, Infrastructure and Transport (MOLIT), the Ministry of the Interior and Safety (MOIS) and the Ministry of Public Safety and Security (MOPSS).

Korea has already halved the number of road fatalities in the last ten years (see Figure 3). If they are further halved, Korea will be on par with some of the best-performing countries in terms of road safety.

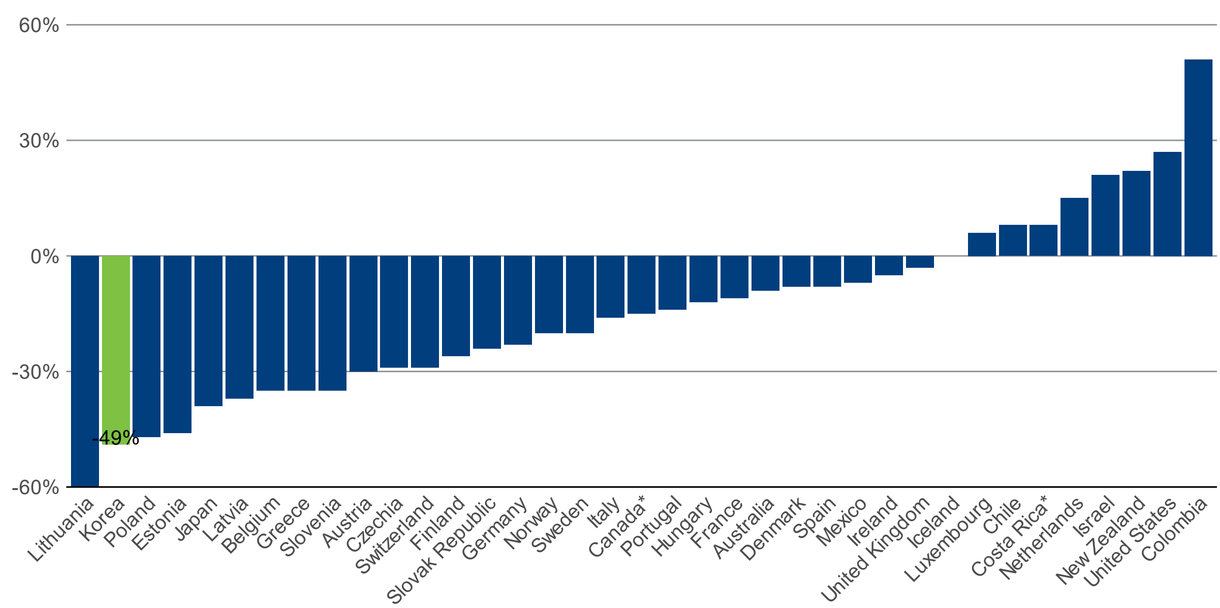
Figure 3. Number of road fatalities in Korea, 2012-22



Source: ITF/IRTAD data.

Road fatalities in Korea peaked in 1991 at 13 429. Since then, except for some fluctuations, the number of road fatalities has been decreasing. Road fatalities in Korea have dropped by roughly 50% in the last 10 years (see Figure 4), which is comparable to the drop in Poland and Estonia during the same period. The decrease in Korea has been the result of several measures such as enhanced speed enforcement (2008), lower speed limits on urban roads and residential areas (2014), compulsory wearing of seat belts (2018), and reduced BAC levels (2019), to name a few.

Figure 4. Difference in road fatalities, OECD countries, 2012-22



Note: * denotes 2021 data. The data from Türkiye is excluded as it has not been validated by IRTAD.
Source: ITF/IRTAD data.

Road-safety legislation in Korea

Several traffic safety laws exist in Korea, which help enforce traffic safety measures. Some of the major laws that govern traffic safety in Korea include the *Traffic Safety Act*, the *Road Traffic Act*, the *Road Act* and the *Pedestrian Safety and Convenience Promotion Act*.

The *Traffic Safety Act* was first enacted in 1979. It stipulates national and local government duties and policies concerning traffic safety and promotes them in a comprehensive and planned manner (Republic of Korea, 2020b). This law is the basis for the five-yearly national plans for traffic safety in Korea. It also stipulates that the government must develop necessary policies for maintaining traffic facilities, give special consideration to pedestrians and persons riding bikes for their protection when developing policies, and establish policies to improve testing and research systems for promoting traffic safety technologies.

The *Road Traffic Act* ensures the safe and smooth flow of traffic by preventing and removing all dangers and obstacles to traffic on roads (Republic of Korea, 2023). It spells out the legal principles for different kinds of users of roads. It stipulates pedestrian sidewalk rules and keep-right rules concerning sidewalks and specifies child-protection zones that can restrict or prohibit traffic in relation to roads around specific facilities. It also stipulates the principles of right-hand traffic for cars and bicycle road traffic. Additionally, it provides the requirements for traffic safety education for anyone who wishes to obtain a driver's license.

The *Road Act* of 1961 promotes the construction of roads for safe and convenient use and enhances public welfare (Republic of Korea, 2018). It provides guidelines on road planning, the assignment of or approval for routes, road management, standards for road facilities, road maintenance and expenses. The act stipulates the use and management of roads by setting standards for road structures and facilities, safety checks, maintenance and management, and installation and management of walkways.

The *Pedestrian Safety and Convenience Promotion Act* was enacted in 2012 to promote public welfare by creating a pleasant pedestrian environment where pedestrians can walk safely and conveniently, protect themselves from any danger, and improve citizens' quality of life (Republic of Korea, 2020a). It lays the legal framework for five-yearly national and regional basic plans for pedestrian safety and convenience enhancement. Such plans include the direction and goal of the policy for improving pedestrian safety; the installation, maintenance and performance improvement of pedestrian safety facilities; and promotion of awareness for pedestrian safety. The act also stipulates pedestrian priority zones, particularly elderly and child protection zones. It also lays the framework for pedestrian-only roads and safety-enhancing facilities.

Korea's 9th National Road Safety Program

The 9th National Road Safety Program lays down Korea's road-safety vision and goals for 2022 to 2026 (MOLIT, 2022). The programme aims to establish a "towards Zero" Safe System in line with international recommendations and policy goals. To eliminate all traffic fatalities, it sets a target of reducing traffic fatalities by 38% from 2021 to 2026. This will be achieved by establishing an accident-prevention system that emphasises the government's responsibility over road-user or community responsibility.

In 2022, Korea recorded 5.3 road fatalities per 100 000 people, which is relatively high compared to other OECD countries. The goal is to reduce this number to 3.5 fatalities per 100 000 people by 2026. Korea also ranks the lowest among OECD countries when it comes to pedestrian fatalities. Additionally, the fatality rate for senior citizens (both pedestrians and drivers) is relatively high. With an ageing society, it is crucial to tackle this problem. The programme therefore focuses on vulnerable groups such as pedestrians, children and senior citizens. Table 3 lists the specific yearly targets set for different indicators.

Table 3. Specific yearly road safety targets under Korea's 9th National Road Safety Program

Indicators		2020	2021	9th Road Safety Program period (2022-26)				
				2022	2023	2024	2025	2026
Main Indicators	No. of road fatalities	3 081	2 916	2 636	2 396	2 178	1 980	1 800
	Road fatalities per 100 000 people	5.9	5.6	5.0	4.6	4.2	3.9	3.5
Sub-Indicators	Road fatalities per 10 000 vehicles	1.1	1.1	1.0	0.9	0.8	0.7	0.6
	Road fatalities per 1 billion km of driving distance	9.3	8.2	8.0	7.2	6.6	6.0	5.4
	No. of serious injuries caused by road collisions	60 564	55 905	51 817	47 099	42 813	38 921	35 383
Detailed Indicators	No. of pedestrian fatalities	1 093	1 018	940	863	786	710	633
	No. of senior citizen fatalities	1 342	1 295	1 154	1 060	966	872	778
	No. of business vehicle driver fatalities	575	569	495	455	414	374	334
	No. of two-wheeled vehicle driver fatalities	525	459	452	416	380	343	307
	No. of child fatalities	24	23	21	19	17	16	14

Source: Based on MOLIT (2022).

The programme identifies five strategic areas, based on recommendations by international road-safety organisations:

1. Traffic System
2. Road Safety
3. Vehicle Safety
4. Road Users
5. Post-crash Response.

For a detailed list of the measures and tasks identified under each strategic area see the Annex.

Recent developments in Korean road safety

MOLIT has instituted several policy goals to enhance road safety in Korea. These encompass several aspects of the road transport system and can broadly be summarised as follows (MOLIT, 2023b):

- establish a comprehensive plan to reduce deaths and injuries from traffic crashes
- support people with limited mobility, such as the physically challenged and the elderly, to travel safely and conveniently
- apply more robust safety measures for managing compressed natural gas (CNG) vehicles
- conduct defects inspection and encourage active recalls of motor vehicles if manufacturing defects are found
- announce the result of motor-vehicle safety evaluation to raise public awareness and promote the manufacturing of safe vehicles
- boost the motor-vehicle tuning market by expanding certified items, introducing the certification system at the manufacturing stage, and a separate certification system for tuning parts produced in small quantities
- introduce the advanced Cooperative Intelligent Transport System (C-ITS), which automatically identifies risks on the road, including crashes and freezing, and gives notification to adjacent vehicles
- improve hazardous roads, secure rest areas (e.g. for drowsy drivers) on expressways and national highways, build up safety facilities such as sidewalks, and tighten safety standards
- strengthen road safety and disaster management with preventive measures and emergency responses to heavy snow, flooding, slope collapse, tunnel fires and so on.

There is also a special emphasis on traffic safety education in Korea. Among other programmes and projects for traffic safety, KoROAD has programmes on traffic safety education. It offers educational training on the prevention of drink driving, compliance with traffic laws, and traffic crash investigation training. These courses are designed for the public, but specialised training is available for traffic police, technical instructors, and local government officials (KoROAD, 2023). It also runs a programme on early education for children and adolescents on traffic safety.

Speeding is one of the leading risk factors for road traffic crashes involving fatalities and serious injuries in Korea. Speeding-prevention measures and speed-limit enforcement have contributed to reducing traffic crashes caused by speeding. Speed control is also at the core of the Safe System approach, which recommends enforcing maximum speed limits depending on the type of roads. In 2016, the Korean National Police Agency adopted the "Safety Speed 5030" policy, with arterial-road speed limits set at 50 km/h, and side-road speeds set at 30 km/h (or even 20 km/h) in several selected urban areas. In the following months and years, several local police agencies also announced a reduction in speed limits (Mitra et al., 2021).

In 2021, the programme was applied nationwide under the enforcement rules of the *Road Traffic Act* (Republic of Korea, 2021). A study analysed the impact of this speed reduction in Busan, where the pilot began in 2017, and the programme was fully implemented by April 2021. In August 2021, after 100 days of full implementation, total fatalities in "5030" areas had decreased by 12.6% (from 317 to 277) and pedestrian fatalities decreased by 16.7% (from 167 to 139) compared to 2020. The decrease was 2.7 times higher than the decrease in total fatalities outside the “5030” areas and 4.5 times higher for pedestrians (Korean Government, 2021). In 2020, MOLIT published the ‘Guidelines for the Establishment and Management of Village Zone’ to support the Village Zone programme. This programme installed traffic-calming measures on national highways passing through rural villages (Wu, Shim and Lee, 2023).

Seat belts were made mandatory for all front passengers in vehicles on highways and motorways in 1990 in Korea. In 2018, Korea made using seat belts mandatory by law for all car passengers. This applies to both commercial and private vehicles (Yonhap News Agency, 2018). The law also made the use of child seats for children under the age of six travelling in a car compulsory. In 2021, an amendment to the *Road Traffic Act* made it mandatory to wear a helmet for all personal mobility devices (Seon-woo, 2021).

In February 2023, MOIS established the “2023 National Pedestrian Safety and Convenience Enhancement Action Plan” for a pedestrian-centred traffic safety system (MOIS, 2023). The plan aims to expand safe walking spaces and includes specific measures for removing pedestrian safety hazards based on crash data, the designation of protection zones for children and the elderly, and the introduction of low-floor buses. The plan also includes a pedestrian safety index as a pilot project that aims to determine the level of pedestrian safety backed by evidence.

In March 2023, the Korean government announced a set of measures for reducing traffic accident deaths (MOLIT, 2023a). The measures focus on strengthening pedestrian safety by implementing a speed limit of 20 km/h for residential areas and designating more protection zones for elderly pedestrians. They also promote the voluntary return of driver’s licences for elderly drivers and the installation of advanced safety support devices for vehicles driven by the elderly. Other measures focus on improved safety of commercial vehicles, such as cancellation of business transport permits for illegal truck modifications and the mandatory equipment of trucks weighing less than 3.5 tons with emergency automatic braking systems.

The need for safety performance indicators in Korea

While several measures and programmes supported by laws have been implemented to improve road safety, the deployment of SPIs is currently lacking. Data on fatalities and injuries is collected and analysed, and this informs Korea’s road-safety strategies.

However, these statistics provide an incomplete picture of the level of road safety as they do not give insights into the causes of crashes and can be subject to random fluctuations (ETSC, 2001). Supplementing these statistics with SPIs is essential as they offer a more complete picture. SPIs help identify new issues as they emerge, and their regular monitoring improves the understanding of the processes that lead to crashes.

The remainder of this report discusses the principles that should guide the development of SPIs, the challenges that might be encountered in the process and the best practices for data collection and methodology. The final chapter examines what indicators should be developed as a starting point, with some context-specific recommendations for Korea, and outlines ways to ensure SPIs can feed effectively into policy-making processes.

Foundations for effective safety performance indicators

Safety performance indicators are causally related to crashes or injuries. They are used in addition to data on crashes or injuries to showcase safety performance and understand the processes that lead to crashes (ETSC, 2001). Developing SPIs effectively requires organisations to be committed and ready to take action to improve road safety. The primary objective of SPIs is to enhance road safety, and they should address specific safety concerns. A willingness to act based on the analysis of the SPIs is crucial for improving road safety.

SPIs should reflect observable properties of traffic, roads and vehicles. To effectively assess road safety, they should focus on easily measurable factors. This is especially true for behavioural indicators but challenging for vehicle safety, infrastructure or post-crash care. For example, the proportion of motorcyclists wearing helmets is a commonly used SPI that can be easily observed and quantified.

Developing SPIs often involves enforcing regulations or taking measures to address safety issues. Organisations should be prepared to enforce laws and regulations for safety concerns identified through SPIs. For instance, if the proportion of motorcyclists wearing helmets is low, the organisation should be ready to make helmets compulsory or act through law enforcement.

In the case of France, in 2010, the government set a target of achieving fewer than 2 000 fatalities by 2020 (ONISR, 2012). An analysis revealed that most crashes and deaths occurred on roads outside built-up areas rather than on highways or in towns. As a result, efforts were directed towards reducing the speed limit on these roads, leading to a change in the law. SPIs played a crucial role in evaluating the impact of this change by measuring the mean speed of vehicles and identifying speed-limit violations.

SPIs should be closely related to the specific safety problem at hand. It is crucial to consider the context and select indicators directly addressing road safety concerns in a particular location or region. SPIs can vary based on various factors, including the income level of countries, the existing level of road safety, behavioural aspects and local travel patterns.

SPIs should also reflect specific contexts. It is crucial to assess the road-safety problem and select indicators that address the challenges in each setting. For instance, in countries like Mali, two-wheeled vehicles are more prevalent than cars and are commonly used by a significant portion of the population. In this case, seat-belt usage might not be the primary concern, whereas bikes and motorcycles pose a greater risk.

How to develop safety performance indicators

Developing SPIs starts with defining the areas that are important to monitor. Indicators should inform practice and provide guidance for improving road safety. The process of developing SPIs should begin with identifying the framework for road safety improvement and determining which indicators can help achieve those improvements. Organisations need to identify the specific aspects of road safety that they want to measure and improve. This can be based on global targets or specific safety concerns relevant to the country. It is essential that a robust causal relationship exists between the SPIs and identified risk factors that lead to crashes and injuries (Papadimitriou and Yannis, 2018).

Once the areas to monitor are defined, the next step is to select indicators for each. Best practices in other countries and expert insights can guide the selection process. Speed is a critical factor in road safety, and measuring speed-related conditions could help improve safety. For example, if the objective is to reduce speed-related crashes, SPIs could measure the percentage of the road network with a safe speed limit and the percentage of drivers not respecting speed limits (by road).

When SPIs have been established, there is a need to continuously monitor strategies aiming to improve them, as well as their implementation, and the achievement of targets. This helps organisations understand the cause-and-effect relationship between the strategy, SPIs and actual crash outcomes and how they evolve. This iterative process allows organisations to continuously improve their road-safety efforts based on the data and analysis conducted.

SPIs should be incorporated into national road safety strategies to track progress and compare it with desired outcomes. It is essential to link SPIs with a robust political vision, align them with the road safety-strategy and understand specific goals and objectives. The following subsections outline what national road-safety authorities and governments should do when developing SPIs.

Address the leading causes of crashes while reflecting specific contexts

It is essential to prioritise areas where the most significant gains are possible and where the most unacceptable situations exist. The areas with the possibility of the highest trauma reduction must be tackled first. The highest priority should be addressing the leading causes of crashes resulting in deaths and injuries, which can be complicated. Leading risk factors for crashes globally include speeding, drink driving, non-use of protective equipment, distracted driving, unsafe road infrastructure, unsafe vehicles, and inadequate post-crash care (WHO, 2018b). These factors should be prioritised when developing SPIs, as they contribute significantly to crashes and their consequences. By targeting these causes, authorities can implement effective measures and interventions to reduce road crashes, injuries and fatalities.

In addition to focusing on these primary causes, it is essential to conduct in-depth crash research to understand the underlying behaviours and factors that contribute to crashes. This research can provide valuable insights into the specific actions, attitudes, and conditions that lead to crashes, enabling authorities to develop more targeted interventions and tailor strategies to specific contexts. This allows for focused and effective change. Understanding local conditions, challenges and behaviours is essential for developing relevant indicators and generating conclusions that can drive effective interventions.

Focus on the complete picture

SPIs must reflect the safety conditions of the entire road traffic system. Ideally, SPIs would cover all pillars of road safety as defined by the ITF (2022), namely, road-safety management, safe roads, safe vehicles, safe speeds, safe road-user behaviour, and post-crash care. If all road-safety pillars are included, the chosen indicators should capture a complete picture of the road safety performance. For example, system designers can effectively analyse the data and make necessary improvements to ensure a Safe System by recording information related to safe roads or safe intersections in a database.

Provide access to relevant data and clearly defined methodologies

Access to relevant data is crucial for identifying problem areas and determining areas for improvement. Without reliable and adequate data, it is difficult to identify the root causes of crashes and make informed decisions on necessary interventions. Reliability, validity and feasibility are essential considerations for data that go into developing SPIs. Reliability ensures consistent measurement based on reliable data sources and methods. Validity ensures that SPIs reflect meaningful aspects of road safety and provide insights into intervention effectiveness. Feasibility considers the practicality and resources required for estimating the chosen SPIs.

Utilising crash data is an effective way to identify road-safety issues and develop SPIs. Analysing comprehensive crash data provides valuable insights into the causes and patterns of crashes (Papadimitriou and Yannis, 2018). However, if complete crash data is unavailable, a small-scale pilot project can be initiated where a team from the road authorities, police department, doctors, and paramedics, if possible, document 50 to 100 road crashes in depth. Such an exercise can provide valuable insights as a starting point for developing relevant SPIs when comprehensive data is unavailable.

It is also necessary to identify the conditions to be measured and areas with potential for safety improvement. This should be followed by developing a comprehensive database for measuring performance over time and prioritising the conditions to be measured. It is crucial to avoid creating too many indicators without a clear connection to the problems that must be addressed, as this can be wasteful.

When developing SPIs, it is crucial to have a well-defined and documented process. The European Transport Safety Council (ETSC) is a central organisation in this field and has worked on SPIs since its foundation. Its Road Safety Performance Index (PIN) reports provide valuable insights into SPI development and implementation (ETSC, 2023).

The European Commission’s SafetyNet project was one of the first projects in the region to define SPIs. It also created a manual for the data collection and calculation of the SPIs (Hakkert, Gitelman and Vis, 2007). The Baseline project has recently produced methodological guidelines and reports for road-safety KPIs in EU Member States (Silverans and Vanhove, 2023). The Trendline project builds on the Baseline project. In addition to the eight KPIs defined by the Commission and used within Baseline, it has identified new indicators. It is also developing appropriate methodologies to test them on a limited scale (Trendline, n.d.).

These projects provide valuable resources, reports and guidelines for creating effective safety performance indicators. The next chapter of this report explores data and methodological approaches for developing SPIs.

Emphasise stability and simplicity

The formulation and definition of SPIs should prioritise simplicity and clarity to ensure unambiguous interpretation of changes in SPI values. For instance, the observation locations for behavioural indicators should be stable, and the indicator must not be subject to change in the long term, as this would result in losing the timeline to track trends. A well-designed SPI should focus on a specific road-safety phenomenon that affects safety and should be sensitive to this phenomenon. In other words, improvements in the phenomenon should automatically translate into changes in the SPI value.

Straightforward and standardised SPIs enhance the meaningfulness and accuracy of comparisons. They enable regions and countries to glean insights from each other's experiences and challenges. Such simplicity streamlines the regular tracking and reporting of road safety data, which is indispensable for gauging progress over time. Overly complex definitions can hinder the assessment of progress and the determination of whether safety initiatives are adequate or if further interventions are necessary.

Agencies responsible for road safety heavily depend on clear SPI definitions to formulate policies and regulations. If the definitions are excessively intricate, policy makers may struggle to discern the root causes of crashes or identify effective countermeasures. Clear SPI definitions, in contrast, foster evidence-based decision making, resulting in more precise and efficient policy development.

Understand and establish shared responsibility for road safety

All stakeholders, including road users, system designers, and other relevant parties, should share responsibility for road safety. It is incorrect to blame road users alone for shortcomings in road safety. Collaboration and co-operation among stakeholders are essential for effectively implementing road-safety strategies. A lead agency should perform this co-ordinating role. There is a need to convince all stakeholders of the utility of establishing SPIs and ensure their active participation in the development process. Gathering input and feedback from stakeholders is also a valuable step in developing SPIs.

Set realistic targets and learn from best practice

Setting ambitious but feasible targets for SPIs and fatality statistics is crucial. The complete elimination of the likelihood of a road crash is beyond the capabilities of individuals, society, institutions and governments. Any goal in this extreme direction would be unrealistic (State Agency Road Safety, 2021). Unrealistic goals undermine the credibility of the entire process, while realistic targets motivate individuals and organisations to work towards achieving them.

Balanced targets that push for improvements while remaining attainable are therefore essential. Examining the experiences and practices of other countries is valuable when developing SPIs. Shared focus areas across countries provide insights and lessons that local authorities can adapt to their specific contexts. Examples of common issues include addressing unsafe speeds, constructing safe roads, alcohol consumption and protecting vulnerable road users.

Monitor and periodically evaluate safety performance indicators

Adopting periodic monitoring and evaluation processes for SPIs that help identify changes over time allows for tracking progress towards set targets, assessing the effectiveness of implemented measures, and making necessary adjustments to optimise road safety performance Identifying intervention thresholds – beyond which action is needed to implement reinforced measures – can also aid SPI monitoring. Analysing the SPI trend will determine what actions are appropriate.

Furthermore, based on the analysis of SPIs over time, it is essential to implement measures and assess their effects on these indicators. Specific measures, such as education, have long-term effects on road safety, while others, such as enforcement, have more immediate impacts. It is crucial to evaluate the effectiveness of implemented measures in achieving the desired outcomes and adjust strategies accordingly. Benchmarking te progress is essential to improving overall road-safety performance.

How to update safety performance indicators

Transport sectors and user behaviours change over time. It is, therefore, essential to update SPIs and introduce new ones to ensure they remain relevant and effective. Updates to SPIs, as with their initial establishment, should be based on Safe System considerations and verified potential to improve road safety. When road-safety authorities link indicators to targets and progress is not occurring, this indicates the need for reinforced policy measures. However, in some cases, it may also suggest the need to change or update the indicator itself.

When updating SPIs, authorities must consider whether the existing SPIs provide sufficient information. This evaluation can be complex, as it involves assessing whether the SPIs effectively capture the necessary insights. Sometimes, it may be necessary to modify the methodology to ensure the SPIs accurately reflect the evolving road safety landscape.

For example, when measuring speed, it is possible that assessing speed alone on different days and times is not enough. It might also be helpful to consider speed dispersion, which is challenging to measure but can lead to valuable insights on crashes and how to tackle them. Additionally, if the current SPI is no longer effective in providing a comprehensive picture, it may be necessary to reassess and modify the indicators. However, it is essential to strike a balance and avoid changing the SPI too frequently to maintain a sense of continuity and enable effective timeline tracking.

A decision on introducing new SPIs may depend on various factors. If a new problem or development emerges (e.g. a new mobility mode), it may warrant the introduction of new SPIs. It is essential to progressively identify risk factors, starting with well-known ones and identifying new ones as road-safety efforts progress. Considerations for including new SPIs can also involve focusing on other relevant emerging problems, such as drug-related traffic incidents.

Regular reviews of existing SPIs are vital to assess their effectiveness and identify any overlooked issues. It is necessary to observe the behaviour shaped by current SPIs and evaluate whether it aligns with the overall road safety objectives. Acquisition of new knowledge and insights into causes and risk factors for crashes guides the development of new SPIs, ensuring that they reflect the latest understanding in the field.

A reasonable timeframe is essential for assessing progress and adjusting regulations and measures as necessary. A four- to five-year year period is typical for monitoring, evaluating and ensuring practical assessment. Greece, for instance, has set intermediate targets at the end of five years and long-term targets over ten years. This approach provides a reasonable timeframe for assessing progress and adjusting as necessary. Periodic evaluations that aim to understand whether the SPIs are adequate to support the policies laid out for road safety effectively are crucial.

Common challenges when introducing safety performance indicators

Several challenges can impact the effectiveness of SPIs in monitoring progress and improving the overall performance of road safety. Some of the common challenges and ways of tackling them are listed below.

Insufficient data for measurement

One of the most common challenges when deploying SPIs is insufficient data availability to measure the desired indicators. Data collection and aggregation can be complex, and there may be instances where relevant data is not readily accessible, making it difficult to develop meaningful and accurate indicators. It is crucial to have access to reliable and relevant data to ensure that the SPIs effectively monitor progress.

Insufficient or unreliable data sources can hinder accurate measurement and tracking of the intended outcomes. Ideally, having all the required data in place would be desirable before implementing an SPI. However, having historical data readily available may not always be feasible. In cases where accurate, comprehensive data is not available readily, developing indicators using incomplete data is still a helpful starting point – as long as the data is good enough to follow and track trends periodically.

Sampling and weighting issues

Determining appropriate sampling strategies to ensure representative data collection can be a challenge. For example, relying solely on police enforcement data may not always provide a complete picture. Researchers may need to collaborate with law-enforcement agencies to conduct additional research (e.g. random testing) to obtain more accurate and comprehensive data.

Figures obtained via targeted enforcement, where police focus on individuals they suspect of a particular behaviour, can result in higher rates of reported incidents. At the same time, random testing may yield lower rates due to the broader sampling approach. As a result, the messages conveyed by different methods can differ significantly.

Inappropriate weighting of samples is another challenge to be aware of. For example, when there are observations of different durations on roads with varying traffic densities, simply averaging the results is not appropriate. Instead, the values must be aggregated for major road types considered for each indicator and weighted based on traffic volumes on each road type.

By combining multiple data sources and methodologies, policy makers and researchers can gain a more accurate and nuanced perspective, leading to better-informed decisions about road-safety initiatives. However, it also requires continuous training and capacity building for staff tasked with data collection and management. Without these investments, it can be challenging to maintain the quality and consistency of the data over time, which can undermine the effectiveness of SPIs in monitoring and improving road safety.

Unclear responsibilities

Another challenge is co-ordination among stakeholders when various organisations are involved in developing SPIs, including collecting and managing data, developing the indicators, monitoring and tracking progress, and setting up policy measures in response. A lack of co-ordination can add complications and make designing and managing SPIs more challenging.

Establishing a lead agency with the authority to co-ordinate efforts can aid in overcoming such challenges. Effective deployment of SPIs requires a long-term commitment to delivering the data and acting based on the trends that emerge from the analysis of the indicators. It is essential for organisations involved in collecting and managing data and developing SPIs to have clear responsibilities and jurisdictions.

All stakeholders involved must have a shared understanding of their roles and responsibilities. They should work collaboratively to ensure that the data is collected, maintained and analysed systematically and consistently and that appropriate action is taken based on the results.

Insufficient resources and high costs

Deploying SPIs requires significant resources, including continuous and renewed funding and human resources. High costs associated with data-collection methodologies, equipment or personnel can limit the extent and quality of data gathered for SPIs (EC, 2022a). Adequate and continuous funding is crucial for implementing robust data collection processes, ensuring data quality, and maintaining the necessary infrastructure to deploy SPIs.

Without sufficient financial resources, organisations may face challenges in effectively collecting, analysing, and utilising the data needed for SPIs. The Asian Development Bank (2022) recommends identifying in advance areas where funding is necessary, including traffic policing, road safety audits and monitoring, emergency services related to road safety trauma, and road safety research and innovation. It is essential to address all funding concerns and allocate resources appropriately to ensure the successful implementation of SPIs.

Political challenges and stakeholder disagreements

Deploying SPIs can often involve dealing with political challenges and disagreements between stakeholders. For example, law-enforcement agencies and transport authorities may have diverging perspectives on road safety, and this can lead to differences, hindering the effective implementation of SPIs. Addressing these political challenges and ensuring collaboration and buy-in from all relevant authorities and stakeholders is crucial. Identifying or establishing a lead agency that oversees this process can ensure constructive partnerships.

Linking road safety with sustainable mobility

Integrating road-safety considerations into broader discussions on transport sector strategies, especially those on sustainable urban mobility, is important. Such holistic discussions promote collaboration between relevant stakeholders. Vulnerable road users, including pedestrians, cyclists and moped riders, account for a significant share of traffic-related fatalities (Euro Cities, 2022). These users are also at the core of sustainable mobility strategies in urban areas. The shift to active and non-motorised transport will only occur when user safety is assured. Developing complementarities between safety and sustainability targets can help improve road safety and achieve the transition to green mobility.

Addressing evolving needs

Another challenge is the need to view transport safety as an evolving system. SPIs should reflect the system's current state but also consider the changing dynamics of mobility. For example, the rise of new modes of non-motorised transport (e.g. electric scooters) can present safety risks in specific contexts. In such cases, indicators could focus on how mobility is evolving, considering new vehicle technologies, the increasing use of electric vehicles (EVs) and the rise of micromobility options.

For example, Norway uses a specific SPI on vehicle technology, defined as the “Percentage of cars with autonomous emergency braking to prevent collisions with pedestrians and cyclists” (Norwegian Public Roads Administration, 2018). Anticipating and incorporating such changes promptly can enhance the overall performance of road-safety strategies.

Balancing feasibility with effectiveness

There is often a trade-off between the ideal SPI and its feasibility. It is not always possible to have a perfect SPI, as there may be limitations in data availability or practical constraints. Selecting feasible and meaningful indicators that still provide valuable insights into road-safety performance is essential. Balancing the tension between ambitious targets and what is realistically achievable is also a challenge when establishing meaningful goals for SPIs.

Data and methodology considerations

High-quality road safety data and statistics are essential for road-safety management (Wegman et al., 2015). Road-safety authorities should collect, analyse and use accurate road-safety data and develop SPIs (ITF, 2022). Systematic data collection and analysis are fundamental in developing and maintaining effective SPIs. Although some SPIs use existing national databases that include total cases (e.g. for post-crash care and vehicle safety), the samples on which SPIs are based should be representative (EC, 2022a).

Therefore, data collection is pivotal in improving road safety (Papadimitriou and Yannis, 2018). Similarly, implementing standardised methodologies plays a crucial role in ensuring the accuracy and reliability of data collection for road safety performance. Numerous projects, including the Baseline and SafetyNet projects, have also performed a developmental role in advancing road-safety performance by offering comprehensive guidelines for road-safety data-collection methodologies.

Guidelines for collecting and managing data

According to Papadimitriou and Yannis, 2018, the main objective of safety data collection should be identifying high-risk areas and prioritising necessary measures. By analysing crash data, authorities can strategically plan improvements that address specific risks. The collected data facilitate investigations into the influence of multiple factors on improving road safety performance. Papadimitriou and Yannis (2018) identified four categories of data for different aspects of road safety improvement (see Table 4).

Table 4. Categories of data for road safety improvement

Type of data	Specific examples
Data to identify the problems	Crash data Risk exposure and performance indicators
Data to identify the solutions	Data on implementation of measures Data on the effectiveness of measures
Macroscopic data	For the whole population By city, region or country Global data
Microscopic data	Behaviour and performance of drivers, passengers and pedestrians Performance of junctions, road segments and small areas Specific crash analysis data

Source: Based on Papadimitriou and Yannis (2018).

Data for problem identification generally fall under three categories: crash data, travel data and performance indicators. Data on the implementation and effectiveness of measures are needed to identify the solutions. These data can be further classified as macroscopic data, which pertains to broader populations or regions, and microscopic data, which focus on specific factors such as driver behaviour, road segments, and crash details.

The meaningful interpretation of crash data requires their combination with exposure data, such as crash rates per kilometre driven or in specific traffic conditions. However, exposure data are frequently unavailable, which can complicate this approach.

Crash causality can be determined by correlating crashes with SPIs, including behaviour, infrastructure, traffic patterns, and vehicle-related factors. Assessing the effectiveness of safety measures is vital for aligning problems with appropriate solutions. Additionally, a detailed analysis of high-resolution data can reveal concealed and crucial crash characteristics. When developing SPIs, authorities must consistently meet certain data characteristics and follow specific guidelines.

Are the data available?

In many cases, the choice for a specific performance indicator depends on data availability. For instance, consider an SPI for driving under the influence of alcohol. According to the theoretical framework of the SafetyNet project, the optimal indicator for assessing alcohol impairment among the general road-user population would be the prevalence and concentration of impairing substances (Hakkert, Gitelman and Vis, 2007).

However, gathering comprehensive data on alcohol and drug use within this population is a complex and challenging endeavour, further complicated by legal obstacles. In many countries, there is a lack of mandatory random testing of road users, making it impossible to calculate this indicator directly. This challenge has led to the use of a road safety indicator as the next best approximation: the percentage of fatalities resulting from crashes involving at least one active road user impaired by alcohol (Bax et al., 2013).

This road-safety indicator, while not an SPI in the strictest sense, is a substitute due to data limitations in many countries. The unavailability of comprehensive and up-to-date data can pose a significant obstacle to the design of SPIs. Efforts to improve road-safety indicators should continue, focusing on enhancing data-collection methods and promoting collaboration between relevant agencies to ensure more direct and reliable data. The alcohol-related SPI has emerged as a practical alternative where direct measurement is challenging or impossible in most countries.

Are the data accessible and traceable?

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 (ITF, 2022). It should also ensure that data are fully accessible in their raw form and reasonable to collect. For example, police often share data via their own analysis rather than providing raw, unprocessed data. Access to raw data allows independent analysis and facilitates a deeper understanding of the data in their original context. Data must also be traceable. This means documenting sources and collection methods, as well as any transformations or calculations applied to the data, to enable tracing back to the original sources.

Are the data reliable and unbiased?

The data used for SPIs should come from credible and reputable sources. It is crucial to rely on data that have been validated and verified for accuracy and reliability. Factors affecting reliability include data-gathering methods (e.g. through surveys) and parameters (e.g. time of day or night). Dedicated research projects focused on data collection and roadside observations can constitute reliable data sources for specific road safety factors (e.g. seat-belt or helmet-wearing rates).

Ensuring the quality of the data is essential. Qualified staff must check them for basic omissions, such as missing values. More thorough data-quality checking (Vis and Van Gent, 2007) might involve a rigorous quality assurance process, including data validation, verification and robust methodologies. When such a process is in place, it is easier to maintain data integrity and reliability.

Data sources should prioritise objectivity and credibility to mitigate potential biases or conflicts of interest. Sourcing SPI data should include a commitment to impartiality and adherence to trustworthy, evidence-based, and scientifically rigorous methodologies. This approach also instils confidence in the accuracy and integrity of the indicators. Decision makers' trust in SPIs will increase when they know that data collection and analysis incorporate transparency, clear and relevant specifications, and a commitment to impartiality. This approach provides a more objective and unbiased perspective, enhancing the credibility of the SPIs.

Are the data comparable?

The ability to compare data is essential when developing SPIs, both within a country and across other countries. It allows for meaningful comparisons and benchmarking to identify areas for improvement. However, comparing performance across countries or regions is complex. The main reasons include the lack of data, the unreliable quality of the data, or the incomparability of the (seemingly similar) data due to different measurement circumstances.

One of the main objectives of the Baseline project was to measure road-safety indicators in a harmonised, internationally comparable way. The project invested considerable resources to develop an adequate methodology to facilitate international comparability (Silverans and Vanhove, 2023). It also highlighted the challenge posed by minor differences in data-collection methods, which can make cross-country comparisons difficult or risky.

Do the data come from multiple sources?

The primary data sources for road-safety performance indicators are roadside observation, questionnaire surveys, administrative databases, and vehicle or road user-related sensors (EC, 2022a). However, a range of other data sources can also provide valuable insights. Examples include police records, hospital data, data on emergency services, road infrastructure data, traffic law enforcement data, vehicle registration data, and vehicle insurance data.

One advantage of these existing databases is that they may cover the whole geographical area under consideration. A second is that no extra costs are involved in their collection (EC, 2022a). For example, insurance data linkage can also be effective, as insurance companies have an incentive to collect and analyse data for risk-management purposes.

Similarly, vehicle insurance companies provide a unique data source on road crashes involving only material damages by breaking down and analysing this specific category of incidents. However, in many countries, accessing vehicle insurance data can be challenging, as each insurance company typically maintains its database structure, making data integration more complex.

The police are typically the initial responders to a crash scene and the final authorities responsible for updating relevant data. Attendance at the crash scene allows police to collect detailed information to identify crash causes and possible solutions. However, A balance needs to be reached between collecting the required information and the time it takes to perform this task. If too much burden is placed on the police, it is less likely that the crash report form will be completed. Nevertheless, police are critical stakeholders in establishing, collecting and using crash data. It is crucial to include them at each stage of the process (PIARC, n.d.).

Hospitals document reasons for admissions and injuries sustained by individuals involved in road crashes (see Box 1 for an example). Hospital data is used to obtain better injury information, mainly when police report data is unavailable or inadequate (PIARC, n.d.). When crash data is under-reported, hospital data is the next most helpful source of information for crash statistics (IRTAD, 2011). Encouraged by the WHO and other institutions, medical authorities have established international recording systems that include road traffic injuries. Two widely used examples are the International Classification of Diseases and Related Health Problems (ICD) and the Abbreviated Injury Scale (AIS) coding systems.

Over the last few years, several new data sources have emerged with implications for SPIs (Owen et al., 2022). These novel data sources, including mobile applications, roadside sensors, and cameras, connected vehicle data (vehicle on-board diagnostics, car and bikesharing data) and GPS data sources, provide opportunities to collect exposure data (including on walking, cycling and public transport use) at low cost.

Research is needed to interpret data from these sources reliably, with attention paid to country-specific regulations on the use of personal data (ITF, 2022). Nevertheless, analysing data from such sources makes it possible to identify unsafe road sections and risky behaviour on the road (including driving while tired). Using machine-learning techniques, such data can help systematically map road system risks – which eventually can become the foundation for formulating SPIs (EC, 2022a).

Box 1. Hospital-based data in Thailand’s Khon Kaen province

The Khon Kaen Regional Hospital in central Thailand has collected and maintained data through its injury surveillance (IS) programme since 1989. Its injury surveillance database aims to obtain more insights into the causes of – and trends in – road-traffic injuries.

The essential data set includes demographic characteristics; time and place of occurrence; type of vehicles; type of road users; mode of patient transfer; risk behaviours (alcohol, use of seat belts, drugs, helmets); nature of first aids; vital signs; comma scale; nature of injury (blunt or penetrating); status at discharge from emergency rooms/wards; diagnosis; and type of injury (crash, self-inflicted, inflicted by others). These data are recorded and kept in a well-prepared electronic file. This file contains more than 20 000 records per year.

A core feature that adds value to hospital-based data the hospital maintains is the ability to perform spatial crash analysis. Ruengsorn (2001) initiated a Geographic Information System (GIS) road-crash database system in Khon Kaen city. The research expanded the crash report form to record the general crash data and assigned the Accident ID to the IS data. This framework allows linking IS records for patients involved in the same crash. Furthermore, data can be linked to occurrence information, including location, time and environment. This systematic use of the hospital’s trauma data makes the data unique compared to other standard IS data from other major hospitals in Thailand.

Source: Kowtanapanich, Tanaboriboon and Charnkol (2007).

Do the data align with safety objectives?

The data characteristics used in developing SPIs must logically align with safety objectives. For instance, if the aim is to ensure pedestrians can safely cross streets, the data collected should be carefully chosen and structured to address this objective directly.

First, the data should focus on relevant parameters such as traffic signal functionality, crosswalk availability, vehicle speeds, pedestrian-vehicle interactions, and traffic volumes, which might be obtainable through surveys at specific locations. Collecting this data set makes it possible to accurately assess whether pedestrians can safely cross streets without undue risk.

Second, the collected data should facilitate the computation of critical safety metrics, such as the proportion of safe crossings. Data from various observation locations should be appropriately weighted, considering factors like road type, traffic conditions, and the duration of the observation session, to ensure accurate and meaningful calculations.

Guidelines for data-collection methodologies

A clear data-collection and analysis methodology is crucial to ensure consistency and comparability. Road-safety authorities should develop standardised methodologies and definitions to enable meaningful analysis and comparison of SPIs. In particular, these methodologies should outline the variables, sampling methods and sources of the data-collection process (see Box 2 for an example).

Consider the local context

It is crucial to consider national amd regional contexts when selecting and analysing data for SPIs. Certain indicators may not be directly comparable within a specific country due to variations in enforcement practices or data-collection methodologies. For example, since several SPIs can refer to the percentage of drivers/road users respecting the applicable traffic rules, it is obvious there is a relation between the severity or level of tolerance allowed by varying traffic rules and the performance of the indicators.

When it comes to speeding, setting higher maximum speed limits can make it easier to comply and result in better performance. For example, if a similar road has a speed limit of 70 km/h in one region and 100 km/h in another, the percentage of drivers complying will likely be higher in the latter. In such cases, better performance might correlate with worse road safety performance (Silverans and Vanhove, 2023). Hence, it is critical to consider such contextual differences when interpreting the results.

Create targets and establish benchmarks

SPIs require targets – quantifiable and specific goals outlining the desired level of safety performance within a certain time frame – to measure progress. Benchmarking involves comparing entities' performance to identify areas of concern and potential improvements. Both concepts are essential in the context of road safety assessment and improvement. Targets are often associated with specific time frames (e.g. one, five or ten years). Setting a time frame helps establish a sense of urgency and accountability in achieving the goal. Targets also provide a precise reference point for assessing progress in improving road-safety conditions. By comparing safety performance with peer countries, regions and cities, benchmarking can help identify and address more common road-safety issues.

Box 2. Harmonising data collection: The Baseline and Trendline projects

The European Commission funded the Baseline project to collect and report road-safety indicators harmonised across all European Union Member States (Vanhove, Moreau and Silverans, 2022). The project also aimed to help build the capacities of those Member States that had not yet collected relevant data for eight key performance indicators (KPIs). trend

The project partners developed a common framework for collecting the indicator data and methodological guidelines for each of the eight KPIs. These guidelines provide a solid foundation, particularly for countries lacking prior experience in SPI development, even outside the EU. The methodological approaches for each KPI include recommendations on data collection (e.g. sample size, observation locations, observation methods, use of existing data sources) and the statistical analysis of the data for calculating the KPIs (i.e. data processing, weighting, aggregation).

The Trendline project builds on this work, bringing together 29 European countries (including 25 EU Member States and four countries as observers) for data collection and analysis. It also aims to help governments deliver and use road safety KPIs in their road safety policies. The project is currently defining and testing ten new experimental and complementary SPIs. This process will produce new guidelines for SPIs that did not exist before, including driving under the influence of drugs, the share of 30 km/h road lane lengths in urban zones, and red-light negation by road users. For example, the Trendline project defines KPI for Distraction as the “Percentage of drivers not using a handheld mobile device”. For data collection under this KPI, the project partners suggest including specific variables for each data point (i.e. each observation or each driver) in the dataset:

- vehicle type: passenger cars, light goods vehicles and heavy goods vehicle
- distraction: use or no use of a handheld mobile device
- road type: motorways, rural roads and urban roads
- date
- start hour
- end hour
- total observation duration
- unique location code (to know which observations belong to the same session)
- unique session code (only needed if the same location is used for different sessions)
- observation session duration
- traffic count duration
- traffic count total (at a minimum, all relevant vehicle types together, ideally per considered type)

Variables such as road type, time period, location code, session code, day and time of a session, and traffic counts can be coded once per session by observers. These variables should then be added in the dataset to each datapoint (i.e. each observed driver) in the same observation session.

Sources: Vanhove, Moreau and Silverans (2022); Stelling et al. (forthcoming).

Account for statistical and sampling issues

SPIs cannot predict specific outcomes, and their interpretation and significance may vary depending on the context of their application. When the confidence interval associated with an SPI value is narrower, it indicates higher precision and reliability in the measurement. In such cases, there is an increased likelihood that any observed differences between this SPI value and another SPI value are statistically significant. In other words, the disparities between the two SPI values are less likely due to random chance or measurement error and more likely to represent genuine variations or trends in road safety performance. A smaller confidence interval provides more robust evidence that the observed differences in SPI values are meaningful and not simply the result of random fluctuations.

Determining the appropriate sample size, location and timing of data collection is crucial for obtaining representative and reliable data. Methodologies for sampling and weighting have been developed and documented in the European SafetyNet project (Hakkert et al., 2007) and further developed in the context of the Baseline and Trendline projects. The outputs from these projects can act as reference points for authorities tasked with developing SPIs in various countries worldwide.

Ensure adequate technical expertise and validation

Having knowledgeable and experienced individuals involved ensures the data is analysed and interpreted effectively. Engaging partners in the data-collection process from an early stage is essential to ensure the objectives are well-aligned among different stakeholders. It is also crucial for academic institutions or agencies to conduct independent checks to validate the processes. This external validation and verification of the data helps ensure its credibility and eliminate potential biases or errors.

Creating safety performance indicators for Korea

The pillars of the Safe System framework, as defined by the ITF (2022b) are road safety management, safe roads, safe speeds, safe vehicles, safe road-user behaviour and post-crash care. National road safety authorities must address these pillars through policy measures to ensure a safe road transport system. Road safety performance indicators developed by countries and regions often address risk factors under these pillars.

The Baseline project, funded by the European Commission, encourages Member States to collect and analyse data for eight KPIs defined by the European Commission in 2019. These KPIs cover speeding, seatbelts and child restraint systems, helmets, alcohol, distraction, vehicle safety, infrastructure, and post-crash care (Silverans and Vanhove, 2023). Covering these areas and monitoring the trends over time would help enhance road safety holistically.

The DaCoTA project recommended a composite index for road safety that considers performance indicators on speed, alcohol and drugs, protective systems, daytime running lights, safe vehicles, safe roads, and trauma management (Bax et al., 2013).

In Norway, one of the safest countries for road users (ETSC, 2023), the focus areas include additional aspects. It has established specific indicators on priority areas that reflect the Norwegian context, including young people and young drivers, pedestrians and cyclists, motorcycles and mopeds, older road users and road users with disabilities, heavy vehicles, and head-on collisions (Norwegian Public Roads Administration, 2022).

Including such context-specific indicators is helpful when tackling specific risk factors that lead to crashes. When a country or a region is beginning to deploy SPIs, the eight primary priority areas recommended by the Baseline project can act as a starting point. This chapter briefly outlines these priority areas before suggesting potential SPIs for the Korean context.

Primary priority areas under the Baseline project

Speeding

Speeding is one of the most significant risk factors for road traffic fatalities and injuries worldwide. Driving at high speed increases collision speeds and the severity of injuries. It also reduces the time for processing and acting on information, makes vehicle steering conditions more unstable, and means drivers have less time to brake. As driving vehicles at higher speeds increases the likelihood and severity of crashes, speed management is recognised as an essential tool for improving road safety (ITF, 2018).

An example of an SPI to tackle this risk factor could be the percentage of vehicles travelling within the prescribed speed limit (Van den Broek, Aarts and Silverans, 2023). A sub-indicator could then cover the type of roads (e.g. motorways, municipal roads or state highways). This SPI would only be comparable with other regions or countries if it refers to the same speed limits. It is also worthwhile to note that it is vital to measure mean speed as a complement to speed compliance. The speed level has a causal relationship with fatalities and serious injuries. Higher speed limits often mean higher speed compliance. Therefore, it is insufficient to analyse at-speed compliance as a standalone indicator.

Use of seatbelts and child restraint systems

Putting the seatbelt on in passenger cars reduces the risk of fatal injuries by 60% for the front passenger and 44% for the rear passenger (Høye, 2016). Similarly, when used correctly, child restraint systems can result in a 60% reduction in deaths (WHO, 2022).

An example of an SPI to measure this risk factor could be wearing rates of protective systems. Data for this SPI should include front and rear passenger car occupants and different types of roads. Sub-indicators could then cover different time periods (e.g. daylight hours, weekdays and weekends).

Use of helmets by riders of bicycles and two-wheelers

When motorcycle riders correctly use helmets, their risk of death and head injury is reduced. One study found that using helmets can reduce the risk of death by 42% and the risk of head injury by 69% (Liu et al., 2008). The use of bicycle helmets also plays a role in reducing deaths and head injuries in the event of a crash. Olivier and Creighton (2016) found that by using helmets, there was a 69% reduction in the risk of serious head injury and a 65% reduction in the risk of fatal head injury in a crash.

Potential SPIs that can account for the use of helmets include the share or the percentage of cyclists/motorcyclists using a helmet correctly. Separate SPIs are necessary for bicycles and powered two-wheelers. Sub-indicators could distinguish between riders and passengers of bikes, mopeds and motorcycles (Yannis and Folla, 2022b). As with other indicators, collecting data for different road types and time periods is essential.

Driving under the influence of alcohol

Crash risk increases significantly when a driver is under the influence of alcohol. A study conducted in the United States showed that with a BAC of 0.5 g/l, a driver's risk of a crash is roughly 1.4 times higher than if they had not consumed alcohol. Furthermore, with a BAC of 1.0 g/l, the risk increases to over four times and with a BAC of 1.5 g/l, the risk is over 20 times higher (Blomberg et al., 2009). Studies also exist on the impact of drug use on the risk of crashes. Hels et al. (2011) found that the risk of death and serious injury for drivers combining alcohol and drugs is 5-30 times greater than that of sober drivers.

SPIs can help tackle this issue and track the trends in the extent of driving under the influence of alcohol or drugs. Norway calculates the percentage of motor vehicle traffic involving intoxicated drivers with a BAC of 0.02 g/l (Norwegian Public Roads Administration, 2018). The Baseline project recommends calculating the percentage of drivers driving within the legal limit for BAC for different road types and periods (Yannis and Folla, 2022a).

Distracted driving

Distraction or inattention while driving a vehicle is another risk factor that poses a challenge. Distraction while driving is usually attributed to mobile phone calls and texting but also includes the operation of the navigation system, eating or drinking, talking to fellow passengers or even daydreaming (SWOV, 2020a). A study in the United States found that the risk of a crash is 2.5 times higher when a driver is engaged in activities such as browsing or typing, reading, sending a text message or entering a phone number than when the driver is not distracted (Dingus et al., 2019).

The Baseline project defines distraction as using a handheld device while driving (Boets, 2023). Here, the word "device" encompasses all handheld devices such as mobile phones, laptops and digital cameras. The indicator recommended by the Baseline project for distraction is the percentage of drivers not using a handheld mobile device.

Vehicle safety

Safe vehicles can potentially prevent deaths and serious injuries in a crash. The safety features of a vehicle can include autonomous emergency braking (AEB), forward collision warning (FCW) and intelligent speed assistance (ISA). It can also include passive safety features such as airbags and safety belts. In several countries, technological features are mandatory in vehicles. For example, as of 2022, cars and vans in EU countries must be equipped with lane-keeping assistance, AEB and improved safety belts (EC, 2019).

The recommended indicator in the Baseline project for safe vehicles is the percentage of new passenger cars with a European New Car Assessment Programme (Euro NCAP) safety rating equal to or above a predefined threshold (Wardenier and Silverans, 2023). Euro NCAP's five-star safety rating system derives from a series of vehicle tests designed and carried out by the organisation (Euro NCAP, 2020). It is regarded as a reliable way of assessing a vehicle's safety performance in the event of a crash.

Other indicators can help evaluate specific technologies. For example, Norway measures the percentage of motor vehicle traffic involving cars with AEB; the percentage of motor vehicle traffic involving cars with lane departure warning; and the percentage of motor vehicle traffic involving cars with AEB to prevent collisions with pedestrians and cyclists (Norwegian Public Roads Administration, 2018).

Infrastructure

Infrastructure and road design have a substantial impact on the overall road safety performance of a country. Safe infrastructure and road design can refer to safe crossings for pedestrians, cyclists and motorcyclists, safe intersections, streets abiding by a low-speed limit, roads with traffic separation and roads adhering to specific safety requirements and ratings. Measures such as footpaths, cycling lanes, safe crossings and intersections, and traffic-calming instruments, can significantly reduce the risk of injury among different types of road users (WHO, 2022).

The Baseline project (Van den Berghe, 2022) recommends four KPIs on infrastructure safety:

1. the percentage of the distance driven over roads with a safety rating above an agreed threshold
2. the percentage of the road network length of roads with a safety rating above an agreed threshold
3. the percentage of the distance driven over roads either with opposite traffic separation (by barrier or area) or with a speed limit equal to or lower than xx km/h in relation to total distance travelled (on all roads)
4. the percentage of the road network length of roads either with opposite traffic separation (by barrier or area) or with a speed limit equal to or lower than xx km/h in relation to the total road network length.

Sweden uses indicators such as the share of 30-50 km/h roads in the municipal road network where speed limits are 30 or 40 km/h; the percentage of pedestrian, bicycle, and moped crossings of good or fair safety classification (on national and municipal roads); and the share of traffic volume on roads with median barriers, for different types of roads (Hurtig et al., 2022).

Post-crash care

Post-crash care, also known as trauma management, is the system that is responsible for providing medical treatment to those injured in a road crash. Adequate and timely post-crash care significantly reduces the risk of fatalities and serious injuries in road crashes. Ensuring timely pre-hospital care and enhancing the quality of both pre-hospital and hospital care can reduce the severity of injuries.

Post-crash care includes initial medical treatment provided by emergency medical services (EMS) at the crash scene and during the transportation to a hospital, and further medical care provided by hospitals and trauma centres (Bax et al., 2013).

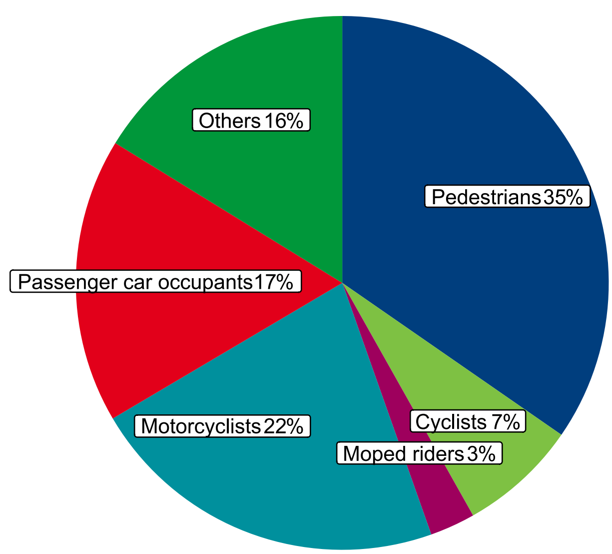
The improved performance of this system includes shorter response time by EMS, higher levels of EMS staff, standardisation of EMS vehicles, and adequate hospital trauma care. The better the post-crash care, the larger the chance of survival and of a better quality of life on survival (ETSC, 2001).

For post-crash care, the KPI recommended by the Baseline project (Nuyttens, 2022) is the time elapsed between the emergency call following a collision resulting in personal injury and the arrival of the emergency services at the scene of the crash. As with some other KPIs, sub-indicators could cover the type of road, the time period, the type of emergency services involved, and the location of the crash.

Tailoring safety performance indicators for the Korean context

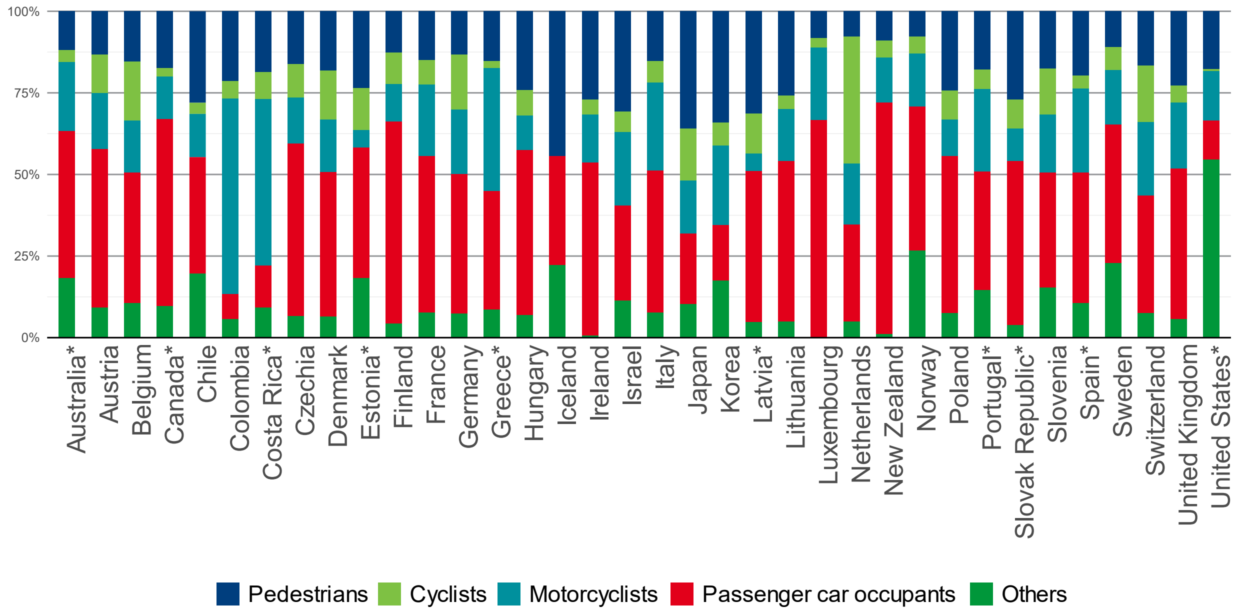
In Korea, pedestrians, cyclists, and motorcyclists accounted for 64% of road fatalities in 2022 (see Figure 5).

Figure 5. Road fatalities by user category in Korea, 2022



Source: ITF/IRTAD data.

Figure 6. Road fatalities by user category in OECD countries, 2022



Notes: * denotes 2021 data. The data from Mexico is excluded as IRTAD has not validated it. No data was available for Türkiye. For the United States, occupants of sports utility vehicles (SUVs) are included in light goods road vehicles, falling under the "other" group.
Sources: ITF/IRTAD (2023) and EU CARE dashboard (EC, 2023b).

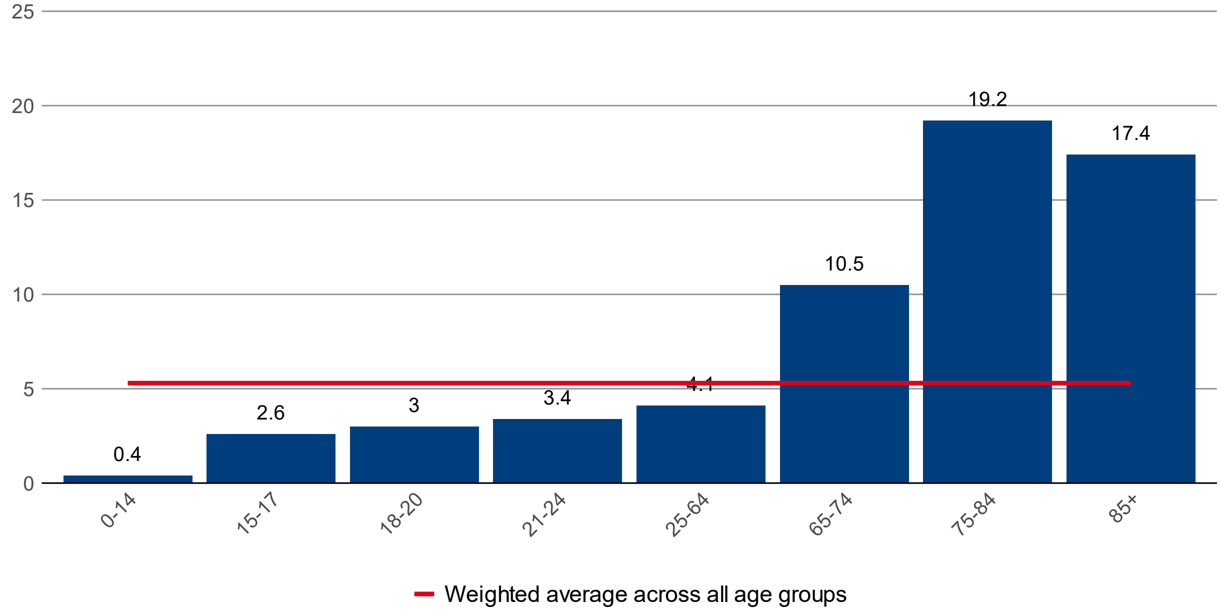
Globally, more than half of all road traffic deaths are among vulnerable road users: pedestrians, cyclists, and motorcyclists (WHO, 2022). Figure 6 shows the share road fatalities for different user groups in the OECD countries.

In the last few years, Korea has taken several steps to improve the safety of these vulnerable road users. It has created pedestrian-priority roads, and installed right-turn signals in areas identified as high-risk (Republic of Korea, 2023). The government has also mandated establishing safety improvement plans for cyclist and motorcyclist safety in high-risk areas. Between 2011 and 2021, bike-only roads in Korea increased by 56% (Statista, 2022). In 2021, the government made it mandatory for users of personal mobility devices to wear a helmet.

Despite these concrete measures, vulnerable road users make up a significant share of road fatalities in Korea. When analysing road fatalities by age group, fatalities among seniors stand out. The road fatality rates for users over 65 years, 75 years and 85 years of age are 10.5, 19.2 and 17.4 deaths per 100 000 inhabitants, respectively (see Figure 7). These rates are significantly higher than the average road fatality rate in Korea (5.3 deaths per 100 000 inhabitants).

The road-crash fatality rate for road users above 65 years in Korea is 14 deaths per 100 000 inhabitants. When compared to other OECD countries, the elderly fatality rate in Korea is relatively high (see Figure 8). This statistic is a cause for concern, given that an estimated 20% of the population of Korea will be over 65 years of age by 2026 (OECD, 2018). As the share of older people in the population increases, promoting road safety focused on seniors becomes even more vital.

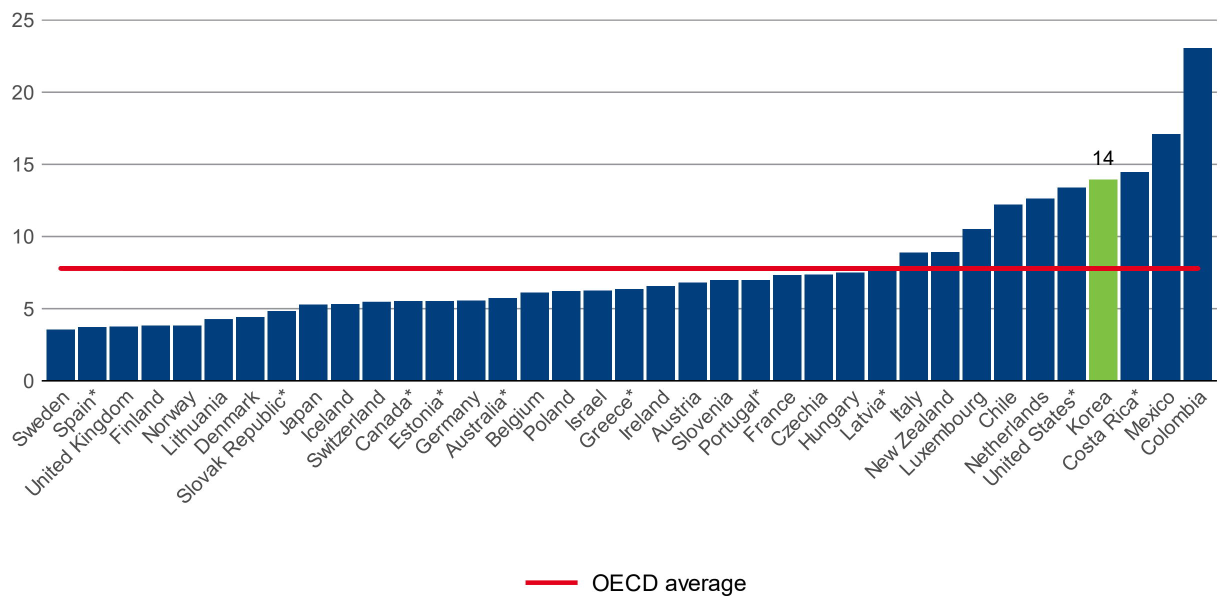
Figure 7. Road-crash fatalities in Korea by age group (deaths per 100 000 inhabitants), 2022



Source: ITF/IRTAD data.

Note: Weighted average across all age groups refers to the fatality rate for the entire population.

Figure 8. Road-crash fatality rate among people aged 65+ in OECD countries, 2022



Note: * denotes 2021 data. The data from Türkiye is excluded as IRTAD has not validated it. For the Netherlands and the United Kingdom, there is currently no available data for individuals aged above 65 years. Therefore, data for individuals over 70 years is used for both countries.
Sources: Ireland: (RSA, 2023); Italy: (LUSTAT, 2023); the Netherlands: (SWOV, 2023); the United Kingdom: (UK Department of Transport, 2023); Estonia, Slovak Republic, and Latvia: EU Care dashboard (EC, 2023b); Remaining countries: ITF/IRTAD data (ITF/IRTAD, 2023)

Potential safety performance indicators for Korea

Given the contextual information outlined in the previous section, when deploying SPIs, Korea could benefit from first focusing on the groups of road users that are most at risk, namely vulnerable road users and older people.

Adopting this focus would mean establishing indicators for pedestrians, cyclists, motorcyclists and older road users to help understand the processes that make these groups prone to crashes. Developing effective SPIs for these groups entails analysing the risk factors leading to crashes among these groups.

Pedestrians and cyclists

Pedestrians and cyclists are relatively unprotected road users interacting with high-speed and mass traffic, making them highly vulnerable. They suffer the most severe consequences in collisions with other road users because they cannot protect themselves against the speed and mass of the other party. Most pedestrian and cyclist crashes occur while crossing the street and sharing the road with other vehicles (Hakkert, Gitelman and Vis, 2007).

Therefore, separation holds immense significance. The fundamental idea behind separation is to create dedicated and distinct spaces for pedestrians and cyclists away from the immediate vicinity of motor vehicles. Such separation for cyclists and pedestrians can take various forms, including dedicated bike lanes, pedestrian walkways, and well-designed intersections with clear boundaries.

Red-light negation or red-light running by all road users is another significant risk factor for pedestrians and cyclists. A substantial portion of crashes involving pedestrians occurs at pedestrian crossings with red lights, where pedestrians cross unexpectedly, and vehicles are unprepared for their presence (and vice versa). A case series (Hobday et al., 2017) investigated eight pedestrian crashes in the Perth metropolitan region in 2015-16. The aim was to pinpoint factors contributing to the risk of these crashes. Over 50% of the pedestrians acknowledged entire or partial responsibility for the crashes (Curtin University, 2017).

Red-light running is common among cyclists (Pai and Jou, 2014). A study in China showed that 56% of bicycle and electric bike users crossed intersections at a red light (Wu, Yao and Zhang, 2012). An observational study in Bologna, Italy, showed that 605 of 1 381 observed cyclists violated traffic signals(Fraboni *et al.*, 2018). Red-light running by car drivers and motorcyclists is also a significant cause of crashes at intersections.

Pedestrians are also at risk of crashes due to other factors, such as the high speed of cars, pedestrian appraisal of the speed of a vehicle, distraction due to handheld devices, being under the influence of alcohol, and low levels of public lighting (SWOV, 2020b). Other risk factors for crashes involving cyclists include unsafe behaviours such as speeding, distraction, red-light running, and driving under the influence by other road users and cyclists. Poor infrastructure, such as low-quality road surfaces, can also lead to cyclist crashes.

Road-safety authorities can reduce the number of crashes involving pedestrians and cyclists by implementing area-wide speed limits, establishing uninterrupted footpaths and separated bike lanes, ensuring proper street lighting, promoting the use of reflective gear, promoting the use of protective equipment and incorporating crash-friendly car fronts to minimise injuries (EC, 2023a). Monitoring pedestrian and cyclist behaviour at junctions (especially adherence to crossing rules and regulations) and supporting policies that promote responsible behaviour can enhance safety for these groups.

Potential safety performance indicators for pedestrians and cyclists

- Share of safe pedestrian crossings on different types of roads and the percentage of pedestrians crossing via the pedestrian crossing facilities. Pedestrian safety relies on two fundamental factors: secure sidewalks along pedestrian routes and safe pedestrian crossing points (although the latter does not address pedestrians' inherent vulnerability while crossing streets). A safe pedestrian crossing can have different definitions. In Sweden, for example, a pedestrian/bicycle/moped crossing is of a good road-safety standard if it is grade-separated or if 85% of occupants pass it at a maximum speed of 30 km/h (Hurtig et al., 2022). Observing whether pedestrians cross correctly at zebra crossings or respect red lights can also be an insightful SPI for pedestrian safety.
- **Proportion of road length adapted for pedestrians and cyclists.** Pedestrian and cyclist risk increases when road design and land-use planning fail to provide facilities such as pavements and bike paths or adequately consider pedestrian and cyclist access at intersections. Infrastructure facilities and traffic control mechanisms that separate them from motor vehicles and enable them to cross roads safely are essential to ensure safety (WHO, 2023).
- **Percentage of cyclists using protective equipment.** Protective equipment such as a helmet can reduce the risk of death or serious injuries in crashes involving cyclists. The indicator used to gauge bicycle helmet use is the share or percentage of cyclists observed wearing a helmet. Understanding the approximate level of helmet use and changes over time can help identify measures to promote the use of helmets further and enhance cyclist safety.
- **Percentage of pedestrians and cyclists using reflective devices.** The issue of pedestrians and cyclists not being properly visible is frequently cited in the literature as a risk for injury (WHO, 2023). Solutions include wearing reflective accessories or brightly coloured clothes in low-light conditions. In Norway, the use of reflectors is one specific SPI due to pedestrian vulnerability in the dark during long winters (Norwegian Public Roads Administration, 2022). The use of protective equipment varies according to national policies and the specific environmental or geographical conditions prevailing in different countries.

Supplementary road-safety indicators

- **Distance covered by cyclists and pedestrians.** Assessing exposure data, such as the distance covered by pedestrians and cyclists, is crucial to understanding risk and evaluating safety trends. However, there is often a lack of information on exposure to these groups, making it challenging to assess crash rates in relation to the increase in the number of cyclists and pedestrians. This indicator is complex to implement nationally. However, at the city level, authorities could reconstruct data from "floating bike" data or exchange information with self-service bicycle operators.
- **Crash rates in relation to the increase in the number of cyclists.** Evaluating whether the rate of crashes is increasing at a higher or lower rate compared to the increase in cycling traffic is vital for policymaking and understanding safety trends. With the rising number of cyclists, an associated increase in crashes is to be expected. The crucial inquiry revolves around whether the surge in the crash rate surpasses or lags behind the escalation in cyclist traffic.

Motorcyclists

Motorcyclists stand apart from cyclists and pedestrians due to the distinct set of risks they face. For motorcyclists, several factors come into play when considering crashes. These include interaction with other road users, high travel speeds, the condition of the road surface and the role played by different types of guard rails. In one European study conducted by ACEM (2009), the leading cause of crashes involving motorcycles and mopeds was human error, with the failure to see the moped or motorcycle being the most frequent, followed by lack of driver attention and temporary view obstructions.

Another important risk factor for motorcyclists is speeding. Speed is a more significant risk factor for moped and motorcycle crashes than other modes (ITF, 2015). Motorcyclists ride at higher average speeds than cars, and crashes usually occur at higher speeds than car crashes (Horswill et al., 2005). Addressing these risk factors through appropriate indicators can help reduce crashes. Monitoring compliance with speed limits is a core SPI for motorcyclist safety. Compliance with low speed limits is crucial for evaluating how well motorcyclists adhere to speed limits and respect prescribed limits to mitigate potential risks. Monitoring helmet usage among motorcyclists is also essential.

Potential safety performance indicators for motorcyclists

- **Percentage of motorcycle riders riding within speed limits.** The percentage of motorcyclists travelling within stipulated speed limits measures excessive speeding, linked to increased road crashes and fatal injuries. Another indicator related to speeding is the average speed of motorcycles.
- **Percentage of riders of motorcycles wearing a protective helmet**. Measuring the share of riders wearing a protective helmet can be useful. However, in some countries, the prevalence of helmet usage eliminates the need for this indicator as it is not a primary concern. It is also crucial to observe the use of other protective gear. In Belgium, for example, motorcyclists must wear ankle boots and vests with long sleeves. Airbags for motorcyclists are also becoming common and could be included depending on the context and prevalence in the coming years.

Supplementary road-safety indicator

- **Number of deaths or serious injuries among motorcyclists per kilometre driven.** Accounting for the number of deaths and serious injuries involving motorcyclists and measuring kilometres driven by motorcycles is a good indicator to assess the risk and compare against targets.

Elderly road users

Elderly road users are at a higher risk in road traffic than younger people for several reasons. Skills that are important while navigating road traffic, such as concentration, observation and processing of information, tend to diminish with age. Besides such functional limitations, older people are also less able to withstand the physical impact of crashes than younger people, and hence, crashes involving older people can often be severe. With an increasingly ageing population, Korea will see a rise in the share of older people among road users. These factors impact not only elderly pedestrians and cyclists but also elderly drivers.

Another factor that increases the risk for seniors is medication, which can also impact their physical function (Sul, Park and Jung, 2013). Several provisions exist in Korea that aim to improve the safety of elderly road users. These include but are not limited to support for older people with walking difficulties, designation and expansion of protection zones for elderly pedestrians, transportation safety education, five-year driver-license renewal cycles, and encouraging older people to voluntarily return their licenses.

Potential safety performance indicator for elderly road users

- Number of deaths or serious injuries for car drivers over 65 years per kilometre driven and the number of deaths or serious injuries for pedestrians over 65 years per kilometre walked. Targets could be set for a future year and then compared to yearly progress. Comparing the targets with the actual, registered data on these indicators would give an idea of whether current measures in place to improve the safety of the elderly population are enough or if further action is needed.

Ensuring effective feedback in policy formulation

Once road-safety authorities have developed safety performance indicators, ensuring that the results and analyses feed into current and future policy measures is crucial. An indicator that does not provide insights that feed into the policy measures can result in the wasteful utilisation of valuable resources.

Aligning safety performance indicators with the policy-making process

This chapter proposes guidelines to ensure effective feedback in policymaking. A lead agency should act as a facilitator and oversight body to ensure these guidelines are followed.

Providing policy makers with evidence of road-safety challenges

Presenting policy makers with evidence demonstrating the magnitude of road-safety problems and the validity of SPIs helps convince them of the significance of the selected indicators and the need for policy changes. Providing policy makers with substantial evidence directly linking road fatalities and injuries to proposed SPIs makes a compelling case for their introduction. By demonstrating these connections, road-safety experts can more effectively communicate proposals to decision makers and advocate for necessary changes and improvements.

Policy makers – and the road-safety measures they introduce – should be open to feedback from the analysis of safety performance indicators. Road-safety programmes should collect evidence that is ready to feed into policy. Selecting SPIs to motivate decision makers to change policies and regulations is essential. SPIs should be policy-friendly, aligning with overall policy objectives. They should be target-oriented, allowing for precise and measurable benchmarks.

Establishing clear objectives and embedding indicators in policies

Identifying the rationale that connects chosen SPIs to desired policy outcomes is crucial. This ensures that the selected indicators directly support the policy goals and provide relevant insights for decision-making. Embedding SPIs in the policy formulation process ensures their inclusion in every stage of decision making.

Once a particular policy is in place, determining indicators that can effectively demonstrate progress towards the policy goals is essential. This involves identifying the necessary data that supports the chosen indicators. Furthermore, it is vital to ensure that the policy formulation process itself is inclusive and allows for feedback and input from the analysis of SPIs. Policies and programs with evidence-collection mechanisms ready to feed into the policy formulation process are vital.

Creating both long-term and intermediate road-safety goals to allow for modifications

Setting long-term goals and regularly monitoring progress makes it possible to assess the effectiveness of implemented policies and make necessary adjustments based on the data and insights gathered. Intermediate goals are also critical in tracking the progress of SPIs and other indicators for road safety. These goals need to be ambitious but feasible. Setting annual goals may not be sufficient, as road safety improvements often require sustained efforts over many years.

Periodically reviewing and redefining road-safety strategies is necessary to ensure their relevance and alignment with evolving circumstances and priorities. Rethinking and redefining a road safety strategy every five years to ensure continuous improvement and adaptation to changing challenges allows for more accurate analysis and informed decision-making.

Collecting and publishing data to foster transparency and accountability

Transparency is vital. Publicly available road-safety data and indicators foster transparency, enable public scrutiny and generate pressure for action. The primary goal should not be limited to data collection and establishment of SPIs but also ensuring transparency in governance and decision-making processes. Making this information public also encourages accountability. Such transparency and accountability at a national or regional level can accelerate the implementation of policy changes necessary to achieve targets.

At the global level, the policy goals announced by organisations like the WHO, European Commission and the UN are pivotal in creating pressure and driving policy changes. Public databases like the EU's CARE database, European transport Safety Council's (ETSC) database, and International Traffic Safety Data and Analysis Group (IRTAD) database, by presenting relevant data, comparing countries' best practices, and evaluating their performances, bring international attention to the issues and stimulate collaborative efforts towards road safety improvement worldwide.

Using safety performance indicators to create a policy-making back-channel

Maintaining an accessible channel for stakeholders and public involvement further enhances transparency and collaboration. Regular meetings should be held with relevant stakeholders to discuss and assess the chosen indicators. These meetings serve as a check to ensure progress is on track and aligns with the policy objectives.

Sweden employs a management-by-objectives approach to provide adequate road safety management. A comprehensive report is produced annually, encompassing all SPIs and data on road fatalities and injuries (Hurtig et al., 2022). The results are presented at a conference, which witnesses active participation from various stakeholders, including government officials and policy makers. To further promote transparency and accessibility, the report is publicly available online, ensuring that all stakeholders can access it easily and track the progress brought about by deploying SPIs and subsequent policy decisions.

Consulting with all affected stakeholders when developing safety performance indicators

Stakeholder engagement is essential when advocating for policy changes. Engaging relevant stakeholders, including law enforcement agencies, transport authorities, road users, transport research institutes and responsible ministries, is critical. Road-safety policies often require co-ordinated efforts across all of these groups. Involving them in selecting indicators – as well as in data collection, analysis and decision-making processes – diversifies the range of perspectives considered, enhances collaboration and increases the chances of successful policy implementation.

Annex. Measures and tasks identified under Korea's 9th National Road Safety Program

Strategic area	Measure	Tasks	Actions
Traffic System	1. Create an environment that prioritises pedestrians	Lower speed limits on roads near pedestrian areas	Reduce speed limits on roads near pedestrian areas Digitise national speed-management network
		Increase the number of roads designated as pedestrian right-of-way roads	Establish a basis for roads with pedestrian right of way Expand the designation of roads with pedestrian right of way
		Expand the introduction of pedestrian-friendly traffic signal operation	Expand the use of pedestrian right-of-way signals, such as leading pedestrian interval (LPI) Introduce pedestrian right-of-way system using IT
	2. Strengthen enforcement and punishment to prevent accidents	Analyse accident risk level by region using big data	Develop measures to predict regional traffic safety risk levels Establish a prevention system by predicting traffic safety risk level
		Restructure the enforcement system to raise awareness of compliance with laws.	Improve the efficiency of the unmanned enforcement system Systematize public interest reporting groups and expand their enforcement authority
		Accident-prevention for high-risk drivers	Review the introduction of progressive fines for repeat offenders Review the introduction of mandatory traffic safety training for high-risk drivers
		Strengthen the obligation to protect pedestrians	Expand responsibility for driver awareness of pedestrian crossings Review the ban on overtaking at crosswalks
	3. Improve specific laws and systems for various targets	Expand regular/joint enforcement for business vehicles	Establish a regular/joint enforcement system for business vehicles Strengthen qualification standards for the business transportation industry
		Introduce a safety management system for two-wheeled delivery vehicles	Introduce unmanned enforcement system for two-wheeled vehicles Establish a basis for a safety management system for the delivery industry
		Improve safety management for personal mobility devices	Establish management measures for shared personal mobility businesses Establish data-based integrated personal mobility data

		Improve driver licensing system for seniors	Continue to expand senior citizen license surrender Introduce a conditional licensing system for senior drivers
	4 Improve operation of areas that protect vulnerable groups	Operate protected areas based on transit and accidents	Expand designation targets and range of protection zones Strengthen the installation of safety facilities in protection zones
		Promote driving restrictions in child protection areas	Restrict traffic during certain times in child protection zones Limit driving using geofence technology
Road Safety	1. Expand road facilities that prioritise pedestrians	Expand traffic calming facilities	Research ways to improve pedestrian-centred road safety Expand the installation of safety facilities, such as traffic-calming facilities
		Expand facilities that prevent accidents at intersections, such as roundabouts	Expand the installation of roundabouts Expand the installation of diagonal and raised crosswalks
		Install safety facilities at crosswalks	Expand the installation of crossing islands in the middle of crosswalks Install crosswalk facilities that protect pedestrians Expand fence installation in areas prone to jaywalking accidents
	2. Improve accident-prone roads	Improve roads that are prone to accidents	Continue to implement improvement projects in accident-prone areas Continue to implement improvement projects on dangerous roads Improve areas prone to traffic safety issues and areas prone to accidents involving vulnerable groups
		Expand safety facility inspections beyond roads	Expand road safety inspections in residential areas Require pedestrian protection in pedestrian areas
		Improve driver visibility	Improve areas where visibility is limited due to illegal parking Remove facilities that limit visibility at intersections
	3. Expand major accident prevention facilities on main roads	Expand Cooperative Intelligent Transport System (C-ITS) infrastructure	Deploy C-ITS infrastructure on highways Deploy smart CCTV on all sections of national highways
		Install accident prevention facilities for driving at night	Expand the installation of rest areas, such as nap areas Expand smart streetlamps and crosswalk lighting
		Install more walking safety facilities on national highways	Institutionalize village resident protection areas Expand installation of safety facilities, such as sidewalks on national highways/local roads
	4. Install infrastructure for	Expand child protection infrastructure	A pilot project to apply a standard maintenance model in child protection zones Expand safety infrastructure in child protection zones

	vulnerable groups	Expand safety facilities for senior citizens	Increase the number of illuminated signs to improve visibility for senior drivers Improve the design of intersections prone to accidents involving senior drivers
		Establish road facilities that promote micro-mobility	Research methods for urban road space redistribution Continue to expand bicycle paths and improve safety facilities
Vehicle Safety	1. Expand the installation of advanced safety devices	Require installation of advanced safety devices	Expand installation of advanced emergency braking systems Pilot operation of drowsiness detection device and drink driving prevention system
		Support safety device installation for vulnerable drivers	Research introduction of blind spot detection device for large vehicles Conduct research to support the installation of advanced safety devices for senior drivers
		Expand utilization of digital tachographs	Spread and improve utilization of low-cost digital tachographs for business vehicles Expand installation of digital tachographs in school buses
	2. Strengthen vehicle safety standards	Strengthen truck driving safety standards	Gradually strengthen collision criteria for small trucks Conduct research on transitioning from open trucks to box trucks
		Reform reporting/inspection system for two-wheeled vehicles	Improve usage report system for two-wheeled vehicles Improve inspection system for two-wheeled vehicles
		Strengthen quality control for vehicle inspections	Develop inspection equipment for advanced driver assistance systems Systematize Vehicle Inspection Competence Test (VICT) system Strengthen enforcement for safety standard violations, etc.
	3. Establish a vehicle safety management system for future vehicles	Introduce safety inspection system for eco-friendly vehicles	Improve accessibility for eco-friendly vehicle inspections Revise safety standards for devices installed in self-driving vehicles
		Establish safety evaluation system for future vehicles	Introduce safety evaluation methods for eco-friendly vehicles Improve safety evaluations for self-driving performance
Road Users	1. Introduce and spread Toward Zero safe system	Introduce training for traffic safety service providers	Introduce a Toward Zero education curriculum Gradually expand professional training programs
		Establish traffic safety education facilities	Introduce training facilities for traffic safety service providers Establish the 3rd traffic safety experiential education centre
		Revitalize regional traffic safety consultative groups	Establish a central-regional-related organization consultative body Establish a traffic safety evaluation system in local governments, etc.
	2. Encourage promotion	Expand promotion to increase the	Continue to run multi-channel public service announcements

	targeting general road users	public's awareness of traffic safety	Actively determine and implement various promotion techniques
		Conduct targeted campaigns for each method, age group, and time period	Continue to conduct targeted promotion campaigns Provide customized traffic safety education by the target audience
	3. Improve inspection and education for business vehicles	Expand safety inspections for business vehicles	Continue to conduct safety inspections for business vehicles Introduce a safety inspection system for rental cars
		Determine management methods for non-business truck companies	Expand experiential education for business vehicle drivers Provide consulting for drivers working in the transportation sector involved in dangerous driving
		Expand training/consulting for business vehicle drivers	Establish measures to manage non-business cargo transportation companies Require traffic safety education for non-business truck drivers
Post-crash Response	1. Establish regional emergency response systems	Upgrade emergency response systems using IT technology	Establish a governance system for traffic accident emergency response Introduce an automatic reporting system for two wheeled-vehicles
		Establish emergency response systems using local governance	Expand the establishment of right-of-way signals for emergency vehicles Expand the introduction of designated license plates to pass unmanned crossing barriers without stopping
	2. Strengthen post-crash response management	Create a system for investigating the causes of traffic accidents	Investigate and analyse traffic accidents and improve systems Establish a regular inspection system in dangerous areas
		Expand support for victims of traffic accidents	Expand the range of support (material resources, quality) for victims of traffic accidents Expand the range of psychological therapy available to victims of traffic accidents and their families

Source: Based on MOLIT (2022).

References

ACEM (2009), “Motorcycle Accident In-Depth Study (MAIDS): In-depth investigations of accidents involving powered two wheelers”, Final Report, v. 2.0, European Association of Motorcycle Manufacturers, Brussels, www.maids-study.eu.

ADB (2022), “The Asia–Pacific Road Safety Observatory’s Indicators for Member Countries”, Asian Development Bank, Manila, www.aprso.org/index.php/document/asia-pacific-road-safety-observatorys-indicators-member-countries.

Bax, C. et al. (2013), “Developing a Road Safety Index”, Road Safety Data, Collection, Transfer and Analysis (DaCoTa) Project Deliverable 4.9, https://www.dacota-project.eu/deliverables.html.

Bemelmans-Videc, M.-L., R.C. Rist and E. Vedung (2017), “Policy instruments: typologies and theories” in *Carrots, Sticks and Sermons: Policy instruments and their evaluation*, Routledge, Abingdon, pp. 21–58.

Blomberg, R.D. et al. (2009), “The Long Beach/Fort Lauderdale relative risk study”, *Journal of Safety Research*, Vol. 40/4, pp. 285-92, https://doi.org/10.1016/j.jsr.2009.07.002.

Boets, S. (2023), “Baseline report on the KPI Distraction”, Vias Institute, Brussels, www.baseline.vias.be/en/publications/kpi-reports/.

DfT (2023), “Reported road casualties Great Britain, provisional results: 2022”, UK Department for Transport, www.gov.uk/government/statistics/reported-road-casualties-great-britain-provisional-results-2022/reported-road-casualties-great-britain-provisional-results-2022 (accessed 4 October 2023).

Dingus, T.A. et al. (2019), “The prevalence of and crash risk associated with primarily cognitive secondary tasks”, *Safety Science*, Vol. 119, pp. 98–105, https://doi.org/10.1016/j.ssci.2019.01.005.

EC (26 March 2019), “Road safety: Commission welcomes agreement on new EU rules to help save lives”, Press release, European Commission, Brussels, https://ec.europa.eu/commission/presscorner/detail/en/IP_19_1793 (accessed 25 July 2023).

EC (2022a), “Road Safety Thematic Report: Road Safety Performance Indicators (RSPIs)”, European Commission, Brussels, https://road-safety.transport.ec.europa.eu/european-road-safety-observatory/data-and-analysis/thematic-reports_en.

EC (2022b), “Road Safety Thematic Report: Safe System Approach”, European Commission, European Road Safety Observatory, Brussels, https://road-safety.transport.ec.europa.eu/european-road-safety-observatory/data-and-analysis/thematic-reports_en.

EC (2023a), “Facts and Figures: Pedestrians, 2023”, European Road Safety Observatory, European Commission, Directorate General for Transport, Brussels, https://road-safety.transport.ec.europa.eu/system/files/2023-02/ff_pedestrians_20230213.pdf.

EC (2023b), “Road Safety Dashboard”, DG MOVE - CARE: Database on road crashes leading to death or injury, European Commission, Brussels, https://dashboard.tech.ec.europa.eu/qs_digit_dashboard_mt/public/extensions/MOVE_CARE_public/MOVE_CARE_public.html (accessed 5 October 2023).

ETSC (2001), “Transport Safety Performance Indicators”, European Transport Safety Council, Brussels, http://etsc.eu/wp-content/uploads/Transport-safety-performance-indicators.pdf.

ETSC (20 June 2023), “17th Annual Road Safety Performance Index (PIN Report)”, European Transport Safety Council, Brussels, https://etsc.eu/17th-annual-road-safety-performance-index-pin-report.

Euro Cities (19 December 2022), “Unbreakable: the link between road safety and sustainable mobility”, https://eurocities.eu/latest/unbreakable-the-link-between-road-safety-and-sustainable-mobility (accessed 12 July 2023).

Euro NCAP (2020), “Euro NCAP Assessment Protocol: Overall Rating”, v. 9.0, European New Car Assessment Programme, Leuven, https://cdn.euroncap.com/media/58030/euro-ncap-assessment-protocol-overall-rating-v90.pdf.

Fraboni, F. et al. (2018), “Red-light running behavior of cyclists in Italy: An observational study”, *Accident Analysis & Prevention*, Vol. 120, pp. 219-32, https://doi.org/10.1016/j.aap.2018.08.013.

Gitelman, V. et al. (2014), “Development of Road Safety Performance Indicators for the European Countries”, *Advances in Social Sciences Research Journal*, Vol. 1/4, pp. 138-58, www.researchgate.net/publication/270550284_Development_of_Road_Safety_Performance_Indicators_for_the_European_Countries.

Government of Korea (2021), “100 days of implementation of ‘Safe Speed 5030’ ... Walking fatalities decreased by 16.7%”, Republic of Korea Policy Briefing, 11 August 2021, https://www.korea.kr/news/policyNewsView.do?newsId=148891484 (accessed 20 July 2023).

Government of Korea (2023), “How is traffic safety changing in Korea?”, Republic of Korea Policy Briefing, 27 March 2023, www.korea.kr/news/policyNewsView.do?newsId=148913131#policyNews (accessed 20 August 2023).

Hakkert, A.S., V. Gitelman and M. Vis (2007), “Road Safety Performance Indicators: Theory”, Deliverable D3.6 of the EU FP6 project SafetyNet, www.fema-online.eu/riderscan/IMG/pdf/safetynet_-_d3.6_-_road_safety_performance_indicators_theory-2.pdf.

Hels, T. et al. (2011), “Risk of injury by driving with alcohol and other drugs”, Driving under the Influence of Drugs, Alcohol and Medicines (DRUID) Project Deliverable D2.3.5, https://orbit.dtu.dk/en/publications/risk-of-injury-by-driving-with-alcohol-and-other-drugs.

Hobday, M. et al. (2017), “In-depth analysis of pedestrian serious injury crashes”, Curtin-Monash Accident Research Centre, Bentley, Western Australia, www.wa.gov.au/system/files/2021-08/In-depth-analysis-of-pedestrian-serious-injury-crashes.PDF.

Horswill, M. et al. (2005), “Motorcycle Accident Risk Could Be Inflated by a Time to Arrival Illusion”, *Optometry and Vision Science*, Vol. 82/8, pp. 740-46, https://doi.org/10.1097/01.opx.0000175563.21423.50.

Høye, A. (2016), “How would increasing seat belt use affect the number of killed or seriously injured light vehicle occupants?”, *Accident Analysis & Prevention*, Vol. 88, pp. 175-86, https://doi.org/10.1016/j.aap.2015.12.022.

Hurtig, P. et al. (2022), “Analysis of road safety trends 2022: Management by objectives for road safety work towards the 2030 interim targets”, Swedish Transport Administration, Borlänge, https://trafikverket.diva-portal.org/smash/record.jsf?pid=diva2%3A1779579&dswid=681.

ITF (2023), "Road fatalities by age and road user", IRTAD Database, International Traffic Safety Data and Analysis Group, https://stats.oecd.org/Index.aspx?DataSetCode=IRTAD_CASUAL_BY_AGE (accessed 6 October 2023).

ITF (2022a), *The Safe System Approach in Action*, ITF Research Report, OECD Publishing, Paris, https://doi.org/10.1787/ad5d82f0-en.

ITF (2022b), *Road Safety Annual Report 2022*, OECD Publishing, Paris, https://doi.org/10.1787/badaa1a4-en.

ITF (2018), *Road Safety Annual Report 2018*, OECD Publishing, Paris, https://doi.org/10.1787/1c884dcb-en.

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 (2015), *Road Safety Annual Report 2015*, OECD Publishing, Paris, https://doi.org/10.1787/irtad-2015-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, www.itf-oecd.org/sites/default/files/docs/road-casualties-web.pdf.

ITF (n.d.), Advancing the Safe System Working Group, www.itf-oecd.org/advancing-safe-system (accessed 11 October 2023).

KoROAD (2023), "Social Education on Traffic Safety", Korean Road Traffic Authority, www.koroad.or.kr/eng/content/view/ME03040000.do (accessed 16 July 2023).

Kowtanapanich, W., Y. Tanaboriboon and T. Charnkol (2007), "A prototype of GIS-based traffic accident database system: Thailand case study", *Proceedings of the Eastern Asia Society for Transportation Studies*, Vol. 6, https://doi.org/10.11175/eastpro.2007.0.358.0.

Liu, B.C. et al. (2008), "Helmets for preventing injury in motorcycle riders", Cochrane Database of Systematic Reviews, https://doi.org/10.1002/14651858.CD004333.pub3.

LUSTAT (2023), "Victims of accidents per road users as regards severity of injury, sex and age", LUSTAT Data Explorer, Statistics Luxembourg, https://lustat.statec.lu/vis?lc=en&pg=0&tm=accident&df[ds]=ds-release&df[id]=DF_C4103&df[ag]=LU1&df[vs]=1.1&pd=2015%2C2022&dq=VL01.C01...A&ly[cl]=TIME_PERIOD&ly[rw]=SEX&ly[rs]=AGE (accessed 3 October 2023).

Mitra, S. et al. (2021), "Do Speed Limit Reductions Help Road Safety? Lessons from the Republic of Korea's Recent Move to Lower Speed Limit on Urban Roads", World Bank, Washington, DC, http://hdl.handle.net/10986/36109.

MOIS (2023), "2023 National Pedestrian Safety and Convenience Promotion Action Plan", Korean Ministry of the Interior and Safety, Safety Improvement Division, www.mois.go.kr/frt/bbs/type001/commonSelectBoardArticle.do;jsessionid=2Gi2Wqc4mqyLbDBXtmal31xY.node40?bbsId=BBSMSTR_000000000015&nttId=98579 [in Korean].

MOLIT (2023a), "Establishment and implementation of 2023 Traffic Accident Death Reduction Measures", Press release, 16 March 2023, Korean Ministry of Land, Infrastructure and Transport, http://molit.go.kr/viewer/skin/doc.html?fn=68a8fd08938bd965c0f98b25a0966376&rs=/viewer/result/20230316 (accessed 13 November 2023, in Korean).

MOLIT (2023b), "Sectoral Policies: Road", Korean Ministry of Land, Infrastructure and Transport, www.molit.go.kr/english/USR/WPGE0201/m_36862/DTL.jsp (accessed 14 July 2023).

MOLIT (2022), "9th National Road Safety Program", Ministry of Land, Infrastructure and Transport, Seoul, http://molit.go.kr/viewer/skin/doc.html?fn=3f774e661393273f795b8c521c83a539&rs=/viewer/result/20220928 [in Korean].

New Zealand Government (2020), "Road to Zero: New Zealand's Road Safety Strategy 2020-2030", Ministry of Transport, Wellington, https://www.transport.govt.nz/assets/Uploads/Report/Road-to-Zero-strategy_final.pdf.

Norwegian Public Roads Administration (2018), "National Plan of Action for Road Safety 2018-2021", https://www.vegvesen.no/globalassets/fag/fokusomrader/trafikksikkerhet/national-plan-of-action-for-road-safety-2018-2021-short-version.pdf.

Norwegian Public Roads Administration (2022), "National Plan of Action for Road Safety 2022-2025", https://www.vegvesen.no/globalassets/fag/fokusomrader/trafikksikkerhet/national-plan-of-action-for-road-safety-2022-2025---short-version-in-english.pdf.

Nuyttens, N. (2022), "Baseline report on the KPI Post-crash Care", Vias Institute, Brussels, www.baseline.vias.be/en/publications/kpi-reports/.

OECD (2018), *Working Better with Age: Korea*, Ageing and Employment Policies, OECD Publishing, Paris, https://doi.org/10.1787/9789264208261-en.

Olivier, J. and P. Creighton (2016), "Bicycle injuries and helmet use: A systematic review and meta-analysis", *International Journal of Epidemiology*, Vol. 46/1, pp. 278-92, https://doi.org/10.1093/ije/dyw360.

ONISR (2012), "Road Safety in France: 2012 Annual Report", Observatoire national interministériel de la sécurité routière [French road safety observatory], Paris, www.onisr.securite-routiere.gouv.fr/en/road-safety-performance/annual-road-safety-reports/2012-road-safety-annual-report.

Owen, R. et al. (2022), "Developing and Measuring Safety Performance Indicators at Sub-National Level", Roundtables Summary Report, Road Safety GB, www.roadsafetyknowledgecentre.org.uk/wp-content/uploads/2022/05/Developing-and-Measuring-Safety-Performance-Indicators-at-Sub-National-Level-Roundtables-Summary-Report-Final.pdf.

Pai, C.-W. and R.-C. Jou (2014), "Cyclists' red-light running behaviours: An examination of risk-taking, opportunistic, and law-obeying behaviours", *Accident Analysis & Prevention*, Vol. 62, pp. 191-98, https://doi.org/10.1016/j.aap.2013.09.008.

Papadimitriou, E. and G. Yannis (2018), "Needs and Uses of Road Safety Data within the UN SafeFITS Model", Presentation to the Albania Road Safety Performance Review Capacity Building Workshop, Durres, Albania, 6-7 February 2018, https://unece.org/DAM/trans/doc/2018/UNDA/II_Needs_and_Uses_of_Road_Safety_Data_within_the_UN_SafeFITS_Model.pdf.

PIARC (n.d.), "Road Safety Management: Effective Management and use of Road Safety Data", PIARC Road Safety Manual, World Road Association, https://roadsafety.piarc.org/en/road-safety-management/safety-data (accessed 8 August 2023).

Republic of Korea (2023), *Road Traffic Act*, Act No. 19158, 3 January 2023, Korea Legislation Research Institute, https://elaw.klri.re.kr/eng_service/lawView.do?lang=ENG&hseq=62211 (accessed 4 July 2023).

Republic of Korea (2020a), *Pedestrian Safety and Convenience Enhancement Act*, Act No. 17694, 22 December 2020, Korea Legislation Research Institute, https://elaw.klri.re.kr/eng_mobile/viewer.do?hseq=55210&type=part&key=11 (accessed 26 June 2023).

Republic of Korea (2020b), *Traffic Safety Act*, Act No. 17445, 9 June 2020, Korea Legislation Research Institute, https://elaw.klri.re.kr/eng_mobile/viewer.do?hseq=55282&type=sogan&key=4 (accessed 2 July 2023).

Republic of Korea (2018), *Road Act*, Act No. 15997, 18 December 2018, Korea Legislation Research Institute, https://elaw.klri.re.kr/eng_mobile/viewer.do?hseq=49884&type=part&key=34 (accessed 15 July 2023).

RSA (2023), "Provisional review of fatalities: 1 January to 31 December 2022", Road Safety Authority, Ireland, www.rsa.ie/docs/default-source/road-safety/r2---statistics/provisional-reviews/provisional-review-of-fatal-collisions-2022c58ae68b-6e98-4025-a8ff-6d3caf39a079.pdf?Status=Master&sfvrsn=b5df4cfa_3.

Ruengsorn, D., Y. Tanaboriboon and W. Chadbunchachai (2001), "Development of GIS based traffic accident database through Trauma Management System: The developing countries experiences, A case study of Khon Kaen, Thailand", *Journal of the Eastern Asia Society for Transportation Studies*, Vol. 4/5, pp. 293-308, https://easts.info/on-line/journal/vol4no5/45022.pdf.

Seon-woo, K. (2021), "Opinion: Bicycles must also wear helmets", Gyeongnam Media, 28 June 2021, www.mediagn.co.kr/news/articleView.html?idxno=10094 (accessed 4 July 2023, in Korean).

Silverans, P. and S. Vanhove (2023), "Baseline conclusions and recommendations", Vias Institute, Brussels, www.baseline.vias.be/en/publications/kpi-reports.

State Agency Road Safety (2021), "National Strategy for Road Safety in the Republic of Bulgaria 2021-2030", Government of Bulgaria, Sofia, www.sars.gov.bg/en/download/national-strategy-for-road-safety-in-the-republic-of-bulgaria-2021-2030/.

Statista (2022), "Length of bicycle lanes in South Korea from 2010 to 2021", www.statista.com/statistics/644716/south-korea-bicycle-lanes-length (accessed 11 September 2023).

Stelling, A. et al. (forthcoming), "KPI Distraction: Methdological Guidelines", Vias Institute, Brussels, www.baseline.vias.be/en/publications/methodological-guidelines-kpi.

Sul, J.H., J.Y. Park and N. Jung (2013), "Transport Safety Policy in Korea", KOTI Knowledge Sharing Reports, No. 4, Korea Transport Institute, Goyang, https://english.koti.re.kr/eng/bbs/specilRschView.do?bbs_no=60929&pg=4&pp=&b_type=&year=&month=&sort=new&stype=&skey=&quarter=.

SWOV (2020a), "Distraction in traffic", Fact Sheet, Institute for Road Safety Research, Den Haag, https://swov.nl/en/fact-sheet/distraction-traffic (accessed 28 July 2023).

SWOV (2020b), "Pedestrians", Fact Sheet, Institute for Road Safety Research, Den Haag, https://swov.nl/en/fact-sheet/pedestrians (accessed 28 July 2023).

SWOV (2023), "Number of traffic fatalities increased by 155 to 737 in 2022", 18 April 2023, https://swov.nl/en/news/number-traffic-fatalities-increased-155-737-2022 (accessed 5 October 2023).

Trendline (n.d.), "About Trendline: Key Performance Indicators", https://trendlineproject.eu/about/key-performance-indicators (accessed 11 October 2023).

UN (2020), General Assembly Resolution 74/299, 31 August 2020, www.undocs.org/A/RES/74/299.

UN (2022), “At High-Level Session, General Assembly Unanimously Adopts Resolution on Improving Global Road Safety, Stresses Commitment to Reduce Fatalities in Half by 2030”, Meeting coverage, 30 June 2022, https://press.un.org/en/2022/ga12432.doc.htm.

Van den Berghe, W. (2022), “Baseline report on the KPI Infrastructure”, Vias Institute, Brussels, www.baseline.vias.be/en/publications/kpi-reports.

Van den Broek, B., L. Aarts and P. Silverans (2023), “Baseline report on the KPI Speeding”, Vias Institute, Brussels, www.baseline.vias.be/en/publications/kpi-reports/.

Vanhove, S., N. Moreau and P. Silverans (2022), “Measuring road safety performance within Europe: First lessons from the Baseline project”, Poster presentation at the Forum of European Road Safety Research Institutes Conference, 6-7 October 2022, The Hague, Netherlands, https://fersi.org/wp-content/uploads/2022/10/Moreau-et-al.pdf.

Vis, M. A. and A. Van Gent (eds) (2007), “Road Safety Performance Indicators: Country Comparisons”, Deliverable D3.7a of the EU FP6 project SafetyNet, https://www.dacota-project.eu/Links/erso/safetynet/fixed/WP3/sn_wp3_d3p7a_spi_country_comparisons.pdf.

Wardenier, N. and P. Silverans (2023), “Baseline report on the KPI Vehicle Safety”, Vias Institute, Brussels, www.baseline.vias.be/en/publications/kpi-reports/.

Wegman, F. et al. (2015), “Evidence-based and data-driven road safety management”, *IATSS Research*, Vol. 39/1, pp. 19-25, https://doi.org/10.1016/j.iatssr.2015.04.001.

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

WHO (2021a), 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 (2021b), “WHO kicks off a Decade of Action for Road Safety”, www.who.int/news/item/28-10-2021-who-kicks-off-a-decade-of-action-for-road-safety (accessed 20 June 2023).

WHO (2022), “Road Traffic Injuries”, Fact Sheet, www.who.int/news-room/fact-sheets/detail/road-traffic-injuries (accessed 26 June 2023).

Wu, C., L. Yao and K. Zhang (2012), “The red-light running behavior of electric bike riders and cyclists at urban intersections in China: An observational study”, *Accident Analysis & Prevention*, Vol. 49, pp. 186-92, https://doi.org/10.1016/j.aap.2011.06.001.

Wu, S.K., J. Shim and D. Lee (2023), “Improvements of Pedestrian Safety through Traffic Calming on Rural Village Roads”, Korea Transport Institute, Goyang, https://english.koti.re.kr/eng/bbs/generalRschView.do?bbs_no=60525.

Yannis, G. and K. Folla (2022a), “Baseline report on the KPI Driving under the Influence of Alcohol”, Vias Institute, Brussels, www.baseline.vias.be/en/publications/kpi-reports.

Yannis, G. and K. Folla (2022b), “Baseline report on the KPI Helmet use among Cyclists and PTWs”, Vias Institute, Brussels, www.baseline.vias.be/en/publications/kpi-reports.

Yonhap News Agency (2018), “All vehicle passengers required to fasten seat belts on all roads”, 27 September 2018, https://en.yna.co.kr/view/AEN20180927007200315.

Using Safety Performance Indicators to Improve Road Safety

The case of Korea

More than 1.3 million people die each year in road crashes, with millions more suffering life-altering injuries. The Safe System approach aims to eliminate deadly crashes through a comprehensive, shared-responsibility framework. This report offers guidelines for establishing safety performance indicators (SPIs) to assess the effectiveness of Safe System policies in reducing road fatalities and serious injuries. It identifies international best practices for constructing and deploying SPIs, focusing on the case of Korea.

International Transport Forum
2 rue André Pascal
F-75775 Paris Cedex 16
+33 (0)1 73 31 25 00
contact@itf-oecd.org
www.itf-oecd.org

Published: 12/2023 | Photo credit: ako photography/Shutterstock