

SUSTAINABLE DEVELOPMENT THROUGH STRATEGIC ROAD SAFETY MANAGEMENT: A REGIONAL APPROACH

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ABSTRACT

Road traffic accidents are a major public health and societal issue, causing around 1.35 million deaths each year and ranking as the eighth leading cause of death globally. This paper addresses the urgent need for comprehensive approach to improve road safety, emphasising the creation of clear and targeted road safety strategies at regional and local levels. It underscores the critical role of strategic road safety management based on the development of effective practices that lead to safer road environments and support sustainable development in communities. The methodology involves a thorough review of global and European road safety initiatives, scientific literature and international best practices, providing their structured overview. The findings highlight that successful road safety initiatives require an integration of top-down and bottom-up approaches and creation of collaborative framework that empowers communities to identify their specific needs while facilitating communication with higher authorities. Key results indicate that targeted interventions, informed by crash data and stakeholder engagement, significantly improve road safety outcomes. The study also emphasises the importance of setting clear objectives and measurable targets in action plans, which are crucial for monitoring progress and ensuring accountability of road safety actions. Conclusions drawn from this research underscore the necessity of a holistic approach to road safety that encompasses legislative and enforcement measures, public awareness, and community involvement. By fostering a culture of safety and responsibility among all road users, the proposed approach can contribute to the global goal of reducing road traffic deaths and serious injuries by at least half by 2030.

Keywords: road safety, strategy, communities, action plans, sustainability, policy, targets.

1 INTRODUCTION

According to the recent annual statistical report on road safety [1], road crashes in the Member States of the European Union resulted in the tragic loss of about 20,634 lives and left over 1.13 million people injured in 2023. Globally, the number of annual road traffic deaths was estimated to be around 1.19 million in 2023 [2]. The comparison of these figures with previous periods shows that efforts to enhance road safety are making a difference, leading to significant reductions in road traffic deaths. It is evident that proven measures, when consistently implemented, can contribute towards making our roads safer for all users.

However, despite this progress, the price on human lives due to road crashes continues to be alarmingly high. From all the statistics is evident that road accidents pose a significant public health concern. But road safety is not only a public health issue but also a significant societal and economic problem. The impact of road accidents extends far beyond the immediate consequences of injury and loss of life, affecting the social and economic stability of communities and nations. From a societal perspective, road accidents have devastating effects on families and communities.

According to the World Health Organization (WHO), approximately 1.35 million people die each year as a result of road traffic crashes, making it the eighth leading cause of death worldwide [2]. Road traffic injuries are also the leading cause of death for children and young adults aged 5–29 years [3], highlighting the profound loss of human potential and



productivity. The psychological trauma and emotional distress experienced by victims and their families are immeasurable, contributing to the broader societal impact of road traffic incidents. It is imperative to take urgent action if the countries over the world aspire to achieve the global goal of reducing road traffic deaths and injuries by at least half by the year 2030.

Road traffic safety is a pressing societal concern that impacts entire society. Despite its widespread impact, addressing this issue often lacks prioritisation in social agendas. There exists a pervasive societal perception that traffic accidents are unfortunate events that happen to others, leading to a general underestimation of personal risk. Current policies and preventive measures often fall short in effectively reducing traffic accidents due to a lack of socially endorsed outcomes, vertical management deficiencies, and inadequate evaluation protocols. This paper underscores the crucial role of strategic road safety management in regional planning for fostering the sustainable development of regions, cities, and local communities.

Drawing on the results of literature analyses and a review of international best practices, the paper proposes a strategic approach for improving road safety. This approach emphasises the creation of targeted and comprehensible road safety strategies, focusing on their implementation at regional and local levels. By tailoring interventions to fit the unique contexts of the environment in which they are implemented, this approach can significantly enhance overall road safety outcome.

2 ROAD SAFETY MANAGEMENT AT GLOBAL AND EUROPEAN LEVEL

Addressing road traffic safety on a global and European scale has been a priority for decades. The following text outlines the global efforts and progress in road traffic safety, highlighting key reports, initiatives, and resolutions from the WHO and UN, including the Decade of Action for Road Safety and the adoption of the Stockholm Declaration. It also provides an overview of the European Union's initiatives to improve road safety, including the setting of strategic goals, development of policies and action plans, together with the establishment of specific expert groups. Key element in most of these reports and initiatives is the emphasis on the important role of local government and community involvement in achieving road safety improvements.

2.1 Global road safety management: Progress and strategic developments

Already in one of the first reports addressing the global assessment of road traffic safety, published by WHO in 1989, it was pointed out that to achieve results in the prevention of deaths and injuries from traffic accidents, it is necessary to promote local government participation and greater community involvement in creating and implementing policies to increase road safety. The main goal was to establish road safety organisations at the national level to support this cooperation.

The publication of the World Report on Road Traffic Injury Prevention in 2004 [4] was a breakthrough in improving road traffic safety. The intention of the document was to increase the commitment of the parties responsible for road safety, provide a rationale for enforcing changes, and lay the foundations for the creation of national governments' action plans. This publication and subsequent advocacy efforts have helped raise global awareness of the problem of traffic accidents and the evidence for effective prevention.

Since the publication of the report, the UN has become a platform for debating the seriousness of the problem of traffic accident consequences. The UN and WHO General Assemblies have issued a series of resolutions outlining steps that their members should follow and enforce. At the same time, the UN established the 'UN Group for Cooperation on

Road Safety'. This activity focused on three areas: developing a series of handbooks on best practices, creating a global database of legal regulations in the field of road traffic safety, and establishing the World Day of Traffic Accident Victims. Meetings were held at the UN to incorporate the issue of reducing the number of traffic accidents into national programs and to create common procedures.

The WHO's 2009 report on the global status of road safety provided the first global analysis of the extent to which countries implement effective road safety measures [5]. These measures included speed limits, drink driving restrictions, and increased use of seat belts, child restraint systems, and motorcycle helmets. Thanks to funding from Bloomberg Philanthropies, the report gathered road safety related data from 178 countries, accounting for over 98% of the global population. It employed a standardised approach with methods that enabled cross-country comparison.

In March 2010, the United Nations General Assembly announced the Decade of Action for Road Safety 2011–2020. To fulfil the goals of the decade, the UN developed a companion document the Plan for the Decade of Action [6]. Some of the main principles of this plan created basis of Sweden's Vision Zero.

The 3rd Global Ministerial Conference on Road Safety 'Achieving Global Goals 2030' resulted in the adoption of the Stockholm Declaration (2020). This declaration was based on the Moscow Declaration of 2009, the Brazilian Declaration of 2015, resolutions of the UN General Assembly, and the World Health Assembly. It linked road safety with the implementation of 'The 2030 Agenda for Sustainable Development' [7]. The Stockholm Declaration also reflects the recommendations of the Conference's Academic Expert Group and its independent and scientific assessment of the progress achieved during the Decade of Action for Road Safety 2011–2020.

In September 2020, the UN General Assembly adopted the resolution 'Improving Global Road Safety' (resolution A/RES/74/299), which declared the Decade of Action for Road Safety 2021–2030 with the ambitious goal of preventing at least 50% of deaths and serious injuries in traffic accidents by 2030. Subsequently, the WHO and the UN regional commissions, in cooperation with other partners from the framework of the UN Road Safety Cooperation, developed the 'Global Plan for the Decade of Action for Road Safety 2021–2030' [8], published in October 2021. The Global Plan aligns with the Stockholm Declaration, emphasising the importance of a holistic approach to road safety and calling for continuous improvement in road and vehicle design, improvement of laws and law enforcement, and providing timely life-saving emergency care to those injured in traffic accidents. The Global Plan also promotes policies from the Stockholm Declaration to encourage walking, cycling, and the use of public transport as healthy and environmentally friendly modes of transport.

The progress achieved during the previous decade of measures for road safety from 2011–2020 laid the foundation for setting measures in these following years. Achievements include mainstreaming road safety into the global health and development agenda, widely disseminating scientific knowledge and best practices, strengthening partnerships and networks, and mobilising resources. This new decade of action provides an opportunity to build on the successes and lessons of previous years.

2.2 European road safety management: Progress and strategic developments

The timescale of road safety strategic management at the level of European Union is presented in Fig. 1.





Figure 1: Timescale of road safety strategic management at the level of European Union.

At the level of the European Union, the first joint efforts to address road transport safety issues began in 1983. Subsequently, an expert group specialising in road transport safety was formed. In 1991, this group developed and published the ‘Report of the High-Level Expert Group for a European Policy for Road Safety’, which became the foundation for creating the first action plan for road safety.

In 1992, the White Paper on the creation of a common EU transport policy was published. In this document was settled that European road safety policy is governed by the ‘subsidiarity principle’, according to which measures are taken at the European level only in cases where road safety problems cannot be solved at the local or national level.

‘The First Action Plan on Road Safety 1993–1996’ introduced an approach to road safety based on qualitative goals and setting specific priorities [9]. The processes of harmonising legislative instruments and implementing joint research programs focused on three main factors affecting the occurrence of traffic accidents: driver behaviour, road infrastructure, and vehicles. Special emphasis was given to the active and passive safety of vehicles, education of road users, and risk factors in driver behaviour (e.g., exceeding speed limits, driving under the influence of alcohol).

As part of ‘The Second Action Plan on Road Safety 1997–2001’, a long-term quantitative goal was set: to progressively reduce the number of fatal traffic accidents by at least 18,000 by 2010 [9]. The plan was designed for implementation at the community level and consisted of three main pillars:

- Collection and dissemination of information and best practices.
- Effective implementation of measures to prevent traffic accidents.
- Strengthening means aimed at reducing the consequences of traffic accidents.

‘The Third Action Plan on Road Safety 2003–2010’ aimed to reduce the number of deaths in road accidents by 50% by 2010 compared to 2000 [9]. Although this goal was not met within the planned deadline, the evaluation in the report entitled ‘Towards a European Road Safety Area: Political Guidelines for Road Safety for 2011–2020’ was positive, as the number of road accident victims decreased significantly. The plan emphasised the need to monitor progress in road safety through performance indicators and mid-term assessments. The measures proposed for improving road traffic safety focused on the following key areas:

- Encouraging road users to improve their behaviour.
- Using technological advances to improve vehicle safety.
- Supporting improvements in road infrastructure.
- Increasing the safety of commercial transport of goods and people.
- Enhancing rescue services and post-accident care.
- Collecting, analysing, and sharing traffic accident data.

In the 2011 White Paper ‘Roadmap to a Single European Transport Area – Towards a Competitive and Resource-Efficient Transport System’ [10], the European Commission extended the deadline to 2020 for meeting the goal of reducing traffic accident deaths by 50% compared to 2010. The year 2050 was set as the deadline for approaching the achievement of zero traffic accidents, in line with Vision Zero. The plan to reduce deaths by half was included in the ‘Road Safety Program for 2011–2020’, which proposed activities divided into three groups:

- Creating a framework for cooperation based on proven procedures in member states.
- Developing a strategy for injury reduction and first aid to mitigate the consequences of traffic accidents.
- Improving the safety of vulnerable road users (especially motorcyclists).

All of these activities are heading towards the fulfilment of seven strategic goals:

1. Improving the education and training of road users.
2. Increasing the enforceability of traffic regulations.
3. Enhancing road infrastructure safety.
4. Making vehicles safer.
5. Supporting the use of technologies to improve road safety.
6. Improving first aid and post-accident care services.
7. Protecting vulnerable road users.

The current ‘EU Strategic Action Plan for Road Safety 2020–2030’ was adopted by the European Commission on 17 May 2018 as part of the 3rd Mobility Package [9]. It focuses on key areas that are crucial for improvement of road safety situation across member states. The progress is measured through eight key Performance Indicators (KPIs) across member states. It is also establishing a ‘Safer Transport Platform’ to fund and support road safety initiatives and preparing legislation on enforcement, driving licenses, and automated vehicles to address emerging technologies and safety challenges. Its actions also include a revision of the Road Infrastructure Safety Management Directive and a creation of strategy for connected and automated mobility.

This strategic action plan contains activities grouped around following eight pillars:

1. Improved road safety management.
2. Stronger financial support for road safety.
3. Safe roads and roadsides.
4. Safe vehicles.
5. Safe use of roads.
6. Quick and effective response of emergency components.
7. Ensuring future road safety.
8. The global role of the EU: exporting road transport safety.



The EU road safety policy framework for 2021–2030 is based on the ‘Safe System approach’, requiring coordinated action from all sectors for all road infrastructure users under an improved management structure. Key actions include:

- Development of new measures to enhance capacity building at the national level.
- Utilisation of EU financial support from the European Structural and Investment Funds for improving road safety infrastructure.
- Establishment of the ‘Safer Transport Platform’ in collaboration with the European Investment Bank.
- Enhancement of funding support for road safety initiatives in the upcoming Multiannual Financial Framework.
- Strengthening research and innovation for the advancement and implementation of Safe System strategies.

An important aspect of this policy framework is the strengthening of financial support for transport safety by ensuring coherence in financing road infrastructure modernisation and other safety-enhancing activities.

3 ROAD SAFETY STRATEGIES

Road safety strategies are a key element of a systematic approach for improving road safety. They describe policy tools applied to individual components to improve road safety, encompassing a wide range of measures aimed at reducing the number of accidents and fatalities on our roads. They are enhancing road safety by addressing the multidisciplinary aspects of road traffic, including human behaviour, vehicles, and road infrastructure [11]. Road safety strategies also contribute to achieving social sustainability in transport and align with the Sustainable Development Goals of ‘Sustainable Cities and Communities’ and ‘Good Health’ by providing safe, affordable, accessible, and sustainable transport systems [12].

A road safety strategy should be comprehensive and evidence-based, targeting high-risk areas and incorporating sustainable, collaborative, innovative, accountable, and inclusive approaches. It should address all aspects of road safety and involve collaboration between government agencies and other stakeholders to ensure long-term goals are met and the needs of all road users are taken into consideration. Performance indicators should be included to measure progress and hold stakeholders accountable for meeting objectives.

A successful road safety strategy should set, revise, or confirm the community’s vision for road safety. This requires establishing specific road safety goals and milestones adapted to the specific conditions. Furthermore, it must outline a collective framework for implementing initiatives designed to reduce road accidents and associated injuries. This framework guarantees that all initiatives are aligned and impactful in enhancing road safety. It is essential to develop a comprehensive roadmap for road safety that defines the vision, objectives, and structure for preventing road accidents and injuries. To build such a strategy, the following steps are recommended:

- Prioritise problems: Identify the most critical issues by analysing data, community needs, and potential impacts on road safety.
- Engage stakeholders: Collaborate with key stakeholders such as local government, law enforcement, healthcare providers, community organisations, and other entities that can have an impact on road safety.
- Define objectives: Clearly outline the road safety goals that the community aims to achieve, ensuring agreement among all stakeholders.



- Establish targets: Set specific, measurable targets for the strategy and compare them to national road safety targets for consistency.
- Develop action plans: Create a detailed plan that includes the steps, resources, and timelines needed to achieve the strategic goals.
- Implement monitoring system: Put in place a system for tracking progress and reporting outcomes regularly to be able to any necessary adjustments to the strategy during its realisation.

This can be achieved through a systematic approach for improving road safety, as outlined in the pyramid model, which is presented in Fig. 2. This model consists of four predefined steps.

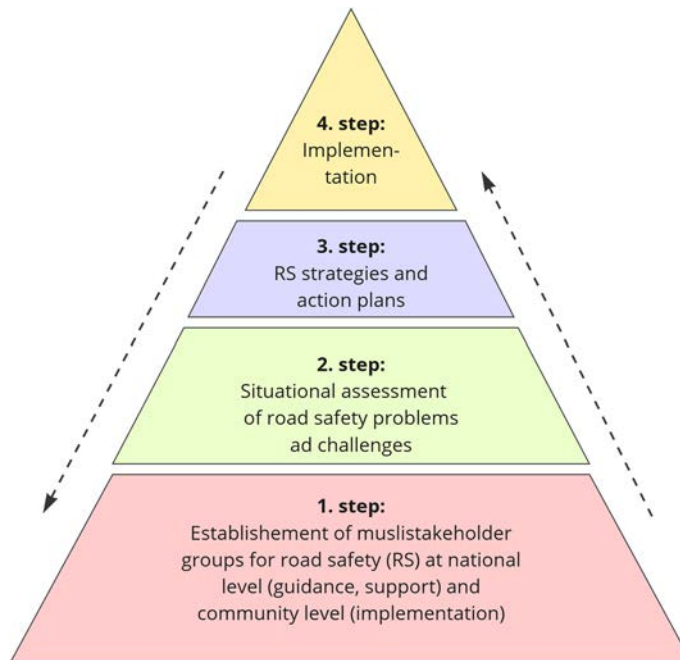


Figure 2: Pyramid model of steps for systematic approach to road safety improvement.

The arrow on the left side of pyramid model represents the top-down approach, when road safety experts engage with local communities to identify the most engaged individuals. These individuals are then equipped with the necessary professional skills and tools needed to address the most important road safety problems within their community. The arrow on the right side of pyramid represents the bottom-up approach, which empower local communities establishing connections with higher authorities to communicate the identified needs and play a proactive role in developing an action plans and pilot projects. This combination of between top-down and bottom-up approaches forms a vertical network of interconnected entities, working together in a continuous exchange of information and expertise.

Road safety strategies vary significantly across countries due to factors such as legislation, enforcement, public support, and national culture. Studies have shown that the maximum legal speeds, penalties for violations, and license renewal procedures established in different

countries significantly impact their road safety outcomes [13]–[15]. Additionally, public support for road safety measures is influenced by perceived restrictions on freedom, fear of discrimination, and resistance to state interventions, with variations based on national culture and social organisation [16], [17]. National culture has been found to correlate with road safety performance and public support for policy measures, with individualism playing a significant role in determining support levels across countries [18]. Furthermore, the legal frameworks for road safety and transport operation are influenced by international, regional, national, and local levels of regulatory support, emphasising the importance of understanding the broader context in which road safety strategies are developed and implemented [19].

Table 1 was created based on the information provided in The World Bank [20], WHO [21] and Borowska-Stefańska et al. [22]. It provides an overview of the worldwide situation regarding key road safety national instruments at level of 175 countries.

Table 1: Worldwide situation regarding key road safety instrument at country level.

Number of countries	Leading agency is present	Leading agency is funded by national budget	Leading agency functions			Road safety strategy which is partially funded	Road safety strategy which is fully funded
			Coordination	Legislation	Monitoring		
Yes	161	130	159	149	144	140	107
No	14	30	2	11	16	34	25
Not clear	0	15	14	15	15	1	43

4 RECOMMENDATIONS FOR CREATION OF COMPREHENSIVE ROAD SAFETY STRATEGIES AND PROJECTS

On the basis of the results of literature analyses and a review of international best practices from countries with overstanding road safety progress the recommendations for creation of comprehensive road safety strategies were formulated.

4.1 Road safety strategies

Evidence shows that road safety programs that have a high-level Champion are more likely to be successful [23]. This level of commitment is critical to the success of road safety projects. Where no obvious Champion is identified, it is recommended that an effort is made to identify one. If there is no desire for road safety nationally, then it can be difficult to generate enthusiasm and support locally. Quite often situation is that the road safety is not a high priority even at national level [12]. In this case the measures are needed to attempt to raise the priority. One way of getting local support, despite the lack of national interest, is to engage with the public and apply pressure to local government through the media [24]. In most societies, road deaths and injuries are personal tragedies that are newsworthy, and bereaved families can provide human interest stories that pressure local politicians to take action [25]. Toriumi et al. [12] have noted that more engagement with the public might be very beneficial for solving this problem.

Another important factor for successful creation of road safety strategy is the fact that the road safety projects should be based on evidence of existing road safety problems [26]. This requires good crash data and a sound analysis. Unfortunately, this data is not always



available [16]. In this case a data collection system should be proposed. By utilising quantitative analysis and a well-established problem identification process, this system can lead to continuously improving crash data over time [26].

The commitment of the stakeholders is another critical success factor [11]. Stakeholders need to commit to road safety projects, and an inspiring strategy can help with this. It can be helpful to have dedicated sub-committees for specific areas (e.g. engineering, publicity, campaigns, and more) to ensure that each aspect of the project is being properly addressed. These sub-committees allow for a more focused approach and ensure that all necessary tasks are being handled effectively. Regular meetings are essential in order to facilitate communication and collaboration among all parties involved. These meetings are the opportunity for updates on progress and discussion of any issues or challenges that may arise on the way for moving forward. Managing and coordinating activities within the stakeholder committees can be a challenging task, but they are vital for the success of the overall strategy [26]. Effective management and coordination ensure that all tasks are being completed in a timely manner, that resources are being allocated efficiently, and that goals are being met. By staying organised and proactive in their approach, stakeholder committees can maximise the involvement of supporting parties and achieve success in their endeavors.

4.2 Regional and local road safety projects

Also road safety projects can be very varied, given the different national and local situations. But similarly to the case of road safety strategies, there can be several aspects highlighted as a part of good practices developed worldwide.

One of the most important aspects of successful road safety project is getting support and commitment for it. While the national strategy addresses the overall road safety scenario of whole the country, the focus of regional and local action plans should be on the specific local conditions. Thus it is imperative for projects to garner strong and organised engagement from local stakeholders, requiring a systematic approach involving various groups, committees, and documented actions [11].

Securing commitment from stakeholders can be a difficult task, especially considering the diverse range of stakeholders involved. The strategies to obtain commitment may differ depending on the individual stakeholders involved. If the project has a Champion (e.g., the Chairman of the Self-governing region or the Mayor of the City), this can be very helpful. Another good practice for maximising stakeholder commitment is creation of a Project Management Group at regional or local level [16]. In addition to effectively managing stakeholders, it is essential to involve the appropriate individuals in the project. Each project should have a unique list of stakeholders that varies according to the country and specific local circumstances. Expanding the range of stakeholders involved usually bring positive outcomes. Engaging the media in this process can provide valuable support and increase awareness. This aspect is often overlooked in road safety initiatives, despite its potential and effectiveness that was confirmed across different countries and circumstances [25].

The projects may vary from one measure to a large number of interventions. Having one or a few measures allows focus and probably gives the best chance for success in the area. On the other hand, if there is a wide range of interventions, then the chances are that some of them will not go well while others will be successful. Both approaches have benefits and disbenefits. Having a small focused project, however, does allow for monitoring, and it is often easier to capture the legacy from the work [26].

Road safety actions often affect a wide range and number of road users, but it is helpful to know what particular groups are likely to benefit most. This information is useful when



designing the intervention, so it can be targeted and gain maximum impact. Using crash data to identify the road safety problems of different groups is a key factor in designing effective action plans [19].

Evidence also shows that road safety programs achieve more valuable outputs when they have clear and easily supported objectives [25]. Including detailly specified targets (e.g. for casualty reductions), can also be good. Action plans work best when the activities are clear and there is a stakeholder who is clearly responsible for each activity. Having timescales and a clear idea about deliverables is also important.

Another important issue to be considered is the budgeting. The best way to get things done is to pay for them and hence have control of the quality and timescales. Relying on stakeholders to do things with their own resources is difficult. Getting stakeholders to deliver to time and quality, especially in these current complicated financial times, is a big challenge. Finances, therefore, are critical, and the allocation of budgets (if any) needs careful attention. Projects often fail because of a lack of financing and commitment.

It is also very important to think about the long-term impact and sustainability of road safety improvement initiatives, particularly focusing on how these efforts can become ingrained in the local community. Consideration should be given to ensuring that the processes of road safety improvement get embedded in the local set-ups. According to stakeholders cited in Hoe et al. [11] and Lucas et al. [23], leaving a legacy of consistently enhancing road safety should be prioritised in all road safety projects. This means that the actions and practices implemented should not only address immediate needs but also have lasting effects that contribute to ongoing safety improvements in the community. By prioritising the establishment of a legacy centered on continuous road safety improvement, the overall success and effectiveness of road safety projects can be maximised.

5 CONCLUSIONS

Road safety is often a ‘background’ activity; something that happens to others and not me. An effort in making everyone aware of the size of the problem and that road death does happen to real people all the time can be very supportive in all road safety initiatives. Road deaths and injuries are preventable, just commitment is needed. Media can significantly help in promoting road safety strategy and getting general public support.

Although progress has been made worldwide in reducing the toll of road traffic crashes over the past decade, much remains to be done, especially the need to raise safety standards in countries with above-average casualty rates to the level that pertains in the best-performing countries. Whilst the main focus of road safety policy is at the national level, the implementation of this policy requires action at regional and local levels. Improving road safety requires the support of the whole of society, not just government and official organisations. Understanding risk and acceptance of the need for all road users to take responsibility for safe behavior, whilst the designers and operators of the road system are responsible for building in safety and accommodating human error, are the fundamental principles underpinning a Systems Approach to road safety.

At the global level, the period 2021–2030 has been proclaimed by the United Nations as a Decade of Action for Road Safety with a goal to stabilise and then reduce the forecast level of road traffic fatalities around the world by increasing activities conducted at the national, regional, and global levels.

At current EU Strategic Action Plan for Road Safety 2020–2030 aims to halve road deaths and serious injuries by 2030. It emphasises the need for involvement of specific bodies to ensure the effective delivery of safety measures by stakeholder engagement. It is also strengthening mandate of the high-level group for road safety, which involves strategic

advisory activity and regular feedback. Additionally, it mentions the role of European Road Safety Coordinator to coordinate efforts with member states and share best practices in order to improve road safety across Europe. It underlines the importance of addressing the stagnation in reducing road deaths by implementing strong measures and ensuring a comprehensive approach to new and existing road safety tool.

The approach presented in this paper has great potential for supporting the achievement of road safety goals set at both, global and European levels. It is based on analysis of the road safety principles, identified in high level strategic documents, and best practices worldwide. Its content is in concordance with the most recent strategic road safety documents that were created for the decade 2021–2030. It provides systematic overview of the process of sustainable road safety improvement and helpful recommendations for realisation of necessary steps would lead the word moving towards the fulfillment of setted target to halve road deaths and serious injuries by 2030.

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