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PIARC Special Project

Motorcycle Protection Systems & Safety aspects of management of traffic for motorcycles

CALL FOR PROPOSALS

Deadline for submission of proposals: 31 January 2025

1 PURPOSE AND STRATEGIC SIGNIFICANCE

1.1 Introduction

Motorcyclists and other powered two-and three-wheeled vehicle riders make up nearly a quarter of the 1.19 million annual road traffic deaths globally, with the number of these vehicles nearly tripling in the decade to 2021.

Motorcycle safety is a critical component of the broader road safety goals outlined under the Safe System approach, which emphasizes the need for systemic changes to improve road safety outcomes. The Safe System approach recognizes that humans make mistakes, and that roads and vehicles should be designed to mitigate these errors, ensuring crashes do not result in fatal or serious injuries. Aligning motorcycle safety initiatives with this framework promotes equitable solutions that account for the vulnerabilities of motorcyclists and supports the shared vision of zero fatalities and serious injuries.

“With the rapid rise in motorcycles, other powered two-and three-wheelers, and an accompanying rise in deaths among riders in many countries and regions, the need to enhance safety measures within the safe systems approach to road safety is crucial, as well as putting policies, measures and actions in place to support safer, healthier and more sustainable transport systems,” said Ms. Evelyn Murphy, the WHO public health lawyer that coordinates the work of the group.

<https://www.who.int/news/item/29-02-2024-world-s-first-global-technical-advisory-group-on-motorcycle-safety-convened-by-who>

This Special Project should address two specific aspects which are linked:

- A. **“Motorcycle Protection Systems”**, especially three aspects that are not specified in standards or manuals like European Standard or USA Manual for Assessing Safety Hardware, regarding Motorcycle Protection Systems and safety barriers (guardrails):
- Motorcyclists’ Crush Cushions (end terminals for motorcyclists for rural roads)
 - Upper guardrail protection for motorcyclists (Continuous Motorcyclist Protection System – CMPS on the **upper side** of a safety barrier)
 - Safety performance evaluations of the reduction of severe injuries from motorcycle guardrail designs that have been used in various countries. Including influences on safety of guardrail ends.
- B. **“Safety aspects of management of traffic for motorcycles”** such as Dedicated Motorcycle Lanes, Lane Splitting and others. Management of traffic for motorcycles and other powered two-and three-wheeled vehicles and its implication in their safety. In North America and in some of European countries these vehicles need to stay in line and behave like a regular car, while in some countries in Europe, South America etc., it is tolerated that they move between lines when there is congestion, with a specific pilot project in France to allow motorcyclist to drive between specific lines in the expressway when the speed is under 50 km/h. In Southeast Asia some infrastructures have been built with specific lines for motorcycles. In Africa, some regions have up to 85% of the vehicles been motorcycles. In some cities motorcycles are accepted in the bust lanes to enhance their safety, while in other cities they are banned from these lines. In Spain, traffic norms are being soon modified to allow motorcycles to drive on road shoulders when traffic is at a standstill, with

a 30km/h maximum speed limit. These road stretches will be designated under the agreement of road administrators and traffic agency, as well as will require to be properly signed.

1.2 Definition of motorcycles and other powered two- and three-wheels vehicles

Motorcycles: There are many definitions depending on country / region and its legislation (considering the speed, designed / construction speed, volume of a motor or power of battery...). For the purpose of this PIARC Special Project, we will consider motorcycles as a two or three-wheeled motor vehicle steered by a handlebar from a saddle-style seat, powered by either a combustion engine or rechargeable batteries, which allows to reach speeds over 45 km/h.

Motorcyclists' Crush Cushions: also referred to as an impact attenuator or an impact absorber, is a device designed specifically to absorb the kinetic energy from the vehicle and / or a rider that collides with it and reduce impact damage to the rider (considering the bio-mechanic limitation of a human body). The ultimate objective of this equipment is, according to the safe system approach, to keep the energy transfer to the human bodies within level compatible with preserving human life and avoiding serious injuries.

Upper guardrail protection for motorcyclists (Continuous Motorcyclist Protection System – CMPS on the upper side of a safety barrier): continuous motorcyclist protection system is placed continuously along a barrier with the purpose of retaining and redirecting an impacting rider, usually preventing direct impact with aggressive elements of the barrier such as upper side of a (steel) barrier, posts, anchorages or module connections, and that also prevents or reduces the consequences of sliding of a rider on a top side of a barrier and coming into contact with any potential hazard of a barrier posts.

Dedicated Motorcycle Lanes or Lane Splitting is a motorcycles traffic management solution in the scope of this project, it refers to regulations and habitudes that define how motorcyclist behaves on the roads and streets, particularly how they circulate in relation to the other road users (other vehicles) and the infrastructure (use of reserved lines, driving between lines, reserved box in front of the traffic lights...).

1.3 Context

As safety of Vulnerable Road Users is a major concern for road operators worldwide, the relevant practical and pragmatic solutions for enhancing safety of motorcyclists would be paramount. In addition, findings could chart a uniform approach regarding the issue, so that further development could be uniformly (harmonized) by all stakeholders.

In Europe there is a standard CEN/TS 17342:2019 "Road restraint systems - Motorcycle road restraint systems which reduce the impact severity of motorcyclist collisions with safety barriers" but unfortunately it does not address motorcyclists' Crush Cushions and upper guardrail protection for motorcyclists.

There are also some solutions on the market, like Armadillo Crash Cushion (but only up to 40 km/h): <https://highwaycare.com/highway-care/armadillo-crash-cushion> and patents like:

<https://worldwide.espacenet.com/patent/search/family/035636829/publication/EP1643036A1?q=pn%3DEP1643036A1>

<https://worldwide.espacenet.com/patent/search/family/069468997/publication/EP4031714A1?q=pn%3DEP4031714A1>

<https://worldwide.espacenet.com/patent/search/family/045715481/publication/EP2450489A2?q=pn%3DEP2450489A2>

<https://worldwide.espacenet.com/patent/search/family/084370323/publication/EP4343064A1?q=pn%3DEP4343064A1>

<https://worldwide.espacenet.com/patent/search/family/043415510/publication/ES1073613U?q=pn%3DES1073613U>

<https://worldwide.espacenet.com/patent/search/family/068343182/publication/WO2021069958A1?q=pn%3DWO2021069958A1>

<https://worldwide.espacenet.com/patent/search/family/042782180/publication/EP2360317A2?q=pn%3DEP2360317A2>

<https://worldwide.espacenet.com/patent/search/family/064607099/publication/WO2020058935A1?q=pn%3DWO2020058935A1>

<https://worldwide.espacenet.com/patent/search/family/077227009/publication/IT202100011477A1?q=pn%3DIT202100011477A1>

<https://worldwide.espacenet.com/patent/search/family/041567131/publication/ES2332553A1?q=pn%3DES2332553A1>

<https://worldwide.espacenet.com/patent/search/family/033156360/publication/EP1484448A2?q=pn%3DEP1484448A2>

<https://worldwide.espacenet.com/patent/search/family/035636829/publication/EP1643036A1?q=pn%3DEP1643036A1>

alongside here are also promising design solutions of retrofitted U-Shape post with barrier like:
https://highways.dot.gov/sites/fhwa.dot.gov/files/2022-07/FHWA-SA-21-069_Addressing_MAC_Recommendations_Rpt.pdf

But unfortunately, road operators need pragmatic (tested solutions) that are applicable and have proven contra measures on road safety and especially for motorcyclists. So key purpose of the project is to identify applicable solutions for wide implementations. If those solutions are not available, there must be given specific professional (expert) direction with guidance for further development of solution.

In parallel, there is a gap between standards and infrastructure solutions, particularly regarding motorcycle safety features like motorcyclists' Crush Cushions, upper guardrail protection and performance evaluations of the reduction of severe injuries resulting from the use of motorcycle guardrail designs and the role of guardrails ends in the motorcyclists' safety. This project will analyse the need for developing and expanding standards to address these specific needs. It should also take into account that standards must be tailored to the unique conditions of LMICs, considering high motorcycle densities, diverse road conditions, and limited infrastructure resources.

1.4 Purpose of the project

The purpose of this Special Project it to develop a global scan across all the regions of the world in these aspects, so good practices can be identified and promoted through the recommendations of this project.

The key questions this Special Project will seek to address are:

1. Currently, what are the Motorcycle Protection Systems used around the world? Specifically, what are the requirements and specification for Motorcyclists' Crush Cushions and Upper guardrail protection for motorcyclists? And what are the proven reductions on severe injuries for motorcyclist's resulting from of the different designs for Motorcycle Protection Systems used around the world, and the effect of the guardrails' end on motorcyclists' safety.
2. What would be the specific and concrete recommendation for future development of standards and regulation regarding Motorcyclists' Crush Cushions, upper and lower guardrail protection for motorcyclists including end of guardrails? How can these specific and concrete recommendations align with the broader goals of the Safe System approach to ensure safer and more forgiving infrastructure for motorcyclists?
3. What kind of standards countries use, testing methods (numerical simulations, experimental tests) and their validation? What would be the recommendation regarding these standards and methods?
4. How is motorcycles' traffic managed in different parts of the world (Dedicated Motorcycle Lanes, Lane Splitting or others), and what are the impacts on their safety? This should include both High Income Countries (HIC) and Low- and Middle-Income Countries (LMIC).
5. Also, weather like (heat, snow, heavy rain etc.) must be considered while providing the solutions and recommendations, as countries have different climate conditions and with that consequent design requirements.
6. What are the gaps between regulation on motorcyclist traffic and actual traffic of motorcyclists and how this gap can impact on their safety?
7. What new capabilities can be brought to address existing challenges; what solutions can be improved for safety of motorcyclists and what things do we think are visible on the 2030 horizon, but are not here yet?
8. What specific recommendations should PIARC make to member countries regarding motorcyclists' safety based on the outcomes of this project? How could these recommendations fit in the Second Decade of Action for Road safety of United Nations?

1.5 Out of scope

Urban electric scooters, where drivers have to stand up are out of the scope for this Special Project.

Human powered two wheelers (bicycles) are out of the scope for this Special Project.

Powered two and three wheelers limited to speeds under 45 km/h are out of the scope for this project.

2 METHODOLOGY AND APPROACH

2.1 Key areas and approach

The answer should include a description of the approach to be taken to collecting and compiling the information being requested. Please take into account that the first two points are the two key areas for consideration in the project and a more thorough description is expected.

The proposal should answer the following questions about the tenderer's approach:

1. How will you collate information from different road administration authorities, transport regulators and operators, other public administrations, academia and relevant industry from international road sector, including successful and unsuccessful case studies, national strategies and pilot projects that deal with Motorcyclists' Crush Cushions and Upper guardrail protection for motorcyclists, including end of guardrails, as well as safety performance evaluations of injury severity resulting from existing motorcycle protection systems/guardrail and on Dedicated Motorcycle Lanes or Lane Splitting for management of motorcycles traffic?
2. LMIC represent an important share of PIARC membership, and it is crucial that their needs, opportunities and challenges are addressed within PIARC activities.
 - a. How will the study consider the reality of lower to middle-income countries?
 - b. How will case studies from LMIC be collated?
 - c. How will their needs be taken into account?
 - d. How will some of the findings of the project be identified as particularly suitable for LMIC?
 - e. How will you ensure any recommendations/next steps can be implemented by LMIC?
3. How will the study identify opportunities, challenges and risks, as well as enablers and barriers to delivery, for practices and regulations regarding Motorcyclists' Crush Cushions, Upper guardrail protection for motorcyclists, including performance evaluations of the reduction of severe injuries from motorcycle guardrail designs and end of guardrails, and Dedicated Motorcycle Lanes, Lane Splitting or others for management of motorcycles traffic?
4. What will be the study milestones in terms of deliverables? What will be the approach for monitoring the progress and to include the inputs from the Project Oversight Team (POT)? It is recommended to organize monthly videoconferences, and to share with the POT regularly intermediate deliverables asking for feedback.
5. How will the management of the project be organized, including quality assurance and quality control without taking significant resources from the project?
6. How will you mobilize the skills needed to complete this work? We consider that the range of skills needed includes understanding road safety, motorcyclist's road safety, safe infrastructure, knowledge of road realities across the globe, among others.
7. How will the study make recommendations to National Road Administrations, road and transport agencies, and PIARC members specifically, to improve motorcyclists' safety through Motorcyclists' Crush Cushions, Upper guardrail protection for motorcyclists, performance evaluations of the reduction of severe injuries from motorcycle guardrail designs, including end of guardrails, and Dedicated Motorcycle Lanes, Lane Splitting or others for management of motorcycles traffic?

8. How will the study propose recommendations to PIARC for taking further into account further this project and to include the outcomes of the project in the current work of PIARC Technical Committee 3.1 in the current cycle 2024 – 2027 and in the PIARC Online Road Safety Manual (<https://roadsafety.piarc.org/en>)?
9. How will the project make recommendations to PIARC member countries and how could these recommendations fit in the Second Decade of Action for Road Safety of UN?

2.2 Options

The proposal can be structured as a core proposal plus additional option.

The bid would then include a core proposal within the proposed budget, and then some options which would be described in detail as well as priced on additional budget.

If the bid is selected, PIARC would place the order for the core proposal and maybe as well for some of the options. This would be done at PIARC's discretion.

In any case, the core proposal must answer all the expectations which are presented in this call for proposals document.

3 FINAL DELIVERABLES

The final deliverables will include:

3.1 Technical Report

The final Technical Report should generally include inputs and sections around the items listed below. Variations to this list may be proposed, but with justification and arguments for PIARC's consideration:

- A literature review.
- A collection of case studies¹ with an overview of practices and regulations and their challenges, risks and opportunities.
- International survey results¹ (if undertaken) or international study conducted by the company aimed at analyzing Motorcyclists' Crush Cushions, Upper guardrail protection for motorcyclists, safety performance evaluations of the reduction in severe injuries with the motorcycle barrier designs that have been used in various countries. Including the end of guardrails, and management of motorcycles traffic.
- Analysis of
 - o Current regulations and standards of Motorcyclists' Crush Cushions, Upper guardrail protection for motorcyclists, performance evaluations of the reduction of severe injuries from motorcycle guardrail designs and end of guardrails. How these regulations and standards should be further developed.
 - o Current practices and regulations for management of motorcycles traffic, and their impact on safety.
- Toolkit for PIARC member organization to approach Motorcyclists' Crush Cushions, Upper guardrail protection for motorcyclists, and management of motorcycles traffic in their countries.
- Conclusions and recommendations for PIARC members and PIARC itself to consider.

¹ PIARC POT will support the dissemination of surveys and call for case studies among Technical Committees and member countries, but the responsibility to ensure appropriate answers to the surveys and call for case studies remains within the bidder of this call for proposals.

A possible structure of the final report could be as follows, although bidders are free to propose their own structures with a rationale:

Executive Summary

1. Introduction: project background, objectives and scope.
2. Methodology and approach.
3. Outcomes of the literature review.
4. Outcomes of the international survey.
5. Case studies analysis from around the world (probably classified by the three sub-sectors: Motorcyclists' Crush Cushions, Upper guardrail protection for motorcyclists, and Dedicated Motorcycle Lanes or Lane Splitting for management of motorcycles traffic).
6. Description and analysis of the current situation for Motorcyclists' Crush Cushions, Upper guardrail protection for motorcyclists, and management of motorcycles traffic.
7. Description of potentials and challenges in this field.
8. Conclusions of the study.
9. Recommendations for road administrations, LMIC and PIARC.
10. References
11. Appendices (such as complete inputs from survey, additional results of the literature review, etc.)

Each chapter of the report should make reference to LMIC, when relevant. A chapter inside the report's conclusions, with possible **specific recommendations for LMIC** should also be considered.

The specific recommendations for public administration bodies and transport regulators are a key element of the report. They should be relevant for policy advisors, decision makers, practitioners and operators, including from the perspective of understanding and meeting the needs of motorcyclists.

The specific recommendations for PIARC could include recommendations to liaise with specific industries, take part in existing conferences and/or how to integrate the outcomes inside TC 3.1 current work 2024-2027 and in the PIARC Online Road Safety Manual.

3.2 Dissemination material

Presentation material to present the results of the Special Project at PIARC Council meeting in 27-28 October 2025 in Goyang, Korea.

The selected tenderer will also be invited to join the meeting physically or via videoconference. The retained option should be specified in the proposal.

3.3 Voluntary contribution to the next PIARC Congress

Voluntary contribution to the Session on the Special Projects inside the World Winter Service and Road Resilience Congress in Chambéry, France, 10-13 March 2026 and maybe on XXVIIIth World Road Congress in Vancouver (Canada), 04-08 October 2027, or other road safety related international conferences. The retained consultant will be invited to join the session (participation is optional) and to provide inputs to the Session program. This contribution will be requested after finalizing the project and out of the project budget. So, this point is provided as information.

3.4 Intellectual property and formats

The final products will be submitted in electronic form in English, using the PIARC template for Technical Report and PIARC template for PowerPoint presentations.

The report will be owned by PIARC, and it will acknowledge the contribution of the external consultant.

PIARC will ensure translation into French and Spanish. In addition, they will make it available free of charge in the World Road Association's Virtual Library to ensure a large world outreach for the report.

4 KEY DATES

The proposal should also include a proposed draft of a work schedule. The schedule should identify dates or timeframes for accomplishing major milestones in the project. The work schedule will include monthly videoconference meetings and dates or timeframe for an interim product or products that allows adequate time for review and feedback prior to the final deliverable. The schedule must be completed, and final report should be delivered by 3 October 2025, so PIARC can proceed to translation and dissemination of document in advance to participants to PIARC Council meeting foreseen in Goyang, Korea, 27-28 October 2025.

These are some of the milestones to be included in the offer:

- Beginning of February 2025: Kick-off videoconference meeting.
- Intermediate milestones to be proposed by the tenderer.
- 10 September 2025: Final draft report for POT to comment on until 24 September 2025.
- 3 October 2025: Finalization of the report in English including all final comments from POT.
- 13 October 2025: Finalization of Council presentation.
- 27-28 October 2025: Presentation at PIARC Council meeting, in presence in Andorra or by virtual participation.
- Voluntary presentation at the World Winter Service and Road Resilience Congress in Chambéry, France, 10-13 March 2026 and maybe on XXVIIIth World Road Congress in Vancouver (Canada), 04-08 October 2027, or other road safety related international conferences.

5 PROPOSED BUDGET

Please provide a general budget for the project. The funding requested from PIARC should not exceed 87,800 Euros all taxes included. The budget should include a general itemization of the

costs of the major work elements of the project and provisional schedule of invoicing.

Invoices will be processed only for completed and approved items, with 10% of each invoice payment to be held back until final deliverables have been accepted by the Project Oversight Team and approved by PIARC.

In line with EU regulations, the payment will take place 60 days after the acceptance of the invoice by the POT.

Since a timing delivery of the outputs is at the essence of the Special Projects mechanism, late penalties could be applied if the external consultant fails to deliver the outputs in the proposed milestones. In line with French regulations, if the delay is the contractor's responsibility, the penalties will be 1% of the budget per week of delay, with a grace period of 15 days, and up to a maximum of 5% of the budget.

6 PROPOSED EXPERTS AND INTERNATIONAL NETWORK

The proposal should also include a description of the relevant expertise that qualifies the contractor to undertake the project. Specifically:

- Please describe any past or current work projects that relate to the subject of this proposal.
- Please also identify the person or persons who will be working on this project, describing their roles and estimated contribution to the project in expertise and time, and providing information on their backgrounds, experience and expertise.
- Please provide information about any other international network, other than the World Road Association, from which the tenderer could receive inputs.

7 PROJECT OVERSIGHT AND PROPOSALS EVALUATION

The project will be overseen by a project evaluation and steering committee called "Project Oversight Team" (POT) to select the preferred tenderer and assist in the development of the project. These experts will be drawn from PIARC membership and will include representatives from several technical committees. Some experts will be nominated by member countries and PIARC General Secretariat staff.

The POT will assess proposals and select the preferred tenderer on the basis of its assessment of:

- a) Technical approach and methodology (up to 35 points): how the tenderer addresses the project objectives and deliverables, how effective and resilient the proposed approach and methodology are, including proposed international case studies and addressing the needs of different PIARC member countries, in particular the LMIC.
- b) Proposed work plan including intermediate milestones (up to 15 points).
- c) Value for money offered by the tenderer (up to 20 points): including the time offered by different contributors of the tenderer's team.
- d) Experience of the proposed team on the holistic vision of the road sector (up to 5 points).
- e) Experience of the proposed team in the field of numerical simulations and experimental

- tests, and traffic management on the motorcycle's safety topic (up to 15 points).
- f) International experience and network of the proposed team (up to 10 points).

The POT will oversee the progress of the Project, including participating in periodic calls, reviewing interim and final products. The POT will also provide any relevant information from the PIARC work to the selected tenderer (e.g., information obtained from surveys) for use in the project. In addition to review and oversight by the POT, input may also be sought from the other members of Technical Committees and the PIARC Executive Committee and Strategic Planning Commission.

8 PROPOSAL SUBMISSION

Proposals should include the elements identified in this Call for Proposals.

Answers must include the following content and characteristics, otherwise they could not be taken into consideration:

1. Executive Summary (maximum 1 page long).
2. Introduction to the tenderer organization/company (maximum 2 pages; appendixes can be added).
3. Project background in the field of numerical simulations and experimental tests, and traffic management for motorcycle safety (maximum 1 page).
4. Proposed methodology and approach (answering to section 2 of current call for proposals).
5. Potential options and deliverables:
 - Additional options if relevant.
 - Technical report.
 - Council presentation.
 - Congress contribution.
6. Work schedule (please provide a definition of tasks and deliverables in a time frame).
7. Budget:
 - Proposed budget for PIARC.
 - Working time included in the budget for different contributors of the proposed team.
 - Proposed schedule of invoices (to be linked to deliverables).
8. Proposed experts, organization of the team and international network
(Maximum a half page by individual, including their experience in the road sector, in the mobility needs, in public policy, their international experience and their experience in LMICs; longer CVs and additional information can be added as appendixes to the proposal.)
9. Appendixes

Page limitations:

The 8 first points should be developed in a maximum of 20 pages.

The whole document should have a maximum of 50 pages including the appendixes.

Proposals should be submitted electronically in English to the World Road Association General Secretariat at:

gen-sec-piarc@piarc.org

no later than:

31 January 2025

For any questions, please send E-mail to gen-sec-piarc@piarc.org