

XXVIth World Road Congress Abu Dhabi, 6-10 October 2019

“Connecting Cultures - Enabling Economies”

CALL FOR PAPERS

The World Road Association (PIARC) is a non-political and non-profit making Association, established in 1909 to promote international cooperation on issues related to roads and road transport. In 2018, PIARC has 121 member governments.

Since 1908, PIARC has organized a World Road Congress every four year. The aim of the Congress is to provide a forum for professionals from all over the world, in every facet of the development, management and operation of roads and road transport, in order to give them an understanding of the progress being achieved in different countries, to discuss current issues and the future challenges faced by the road sector, as well as share knowledge.

The XXVIth World Road Congress will be held in Abu Dhabi, United Arab Emirates, from 6 to 10 October 2019. It will include around 50 sessions, a large exhibition, technical visits and social activities.

For more information, please refer to the congress website:

<http://piarcabudhabi2019.org>

CALL FOR PAPERS

For this XXVIth edition, PIARC is calling for individual contributions on selected topics in order to enrich and broaden the views and work of its Technical Committees and Task Forces.

Papers will be reviewed by the Technical Committees and Task Forces. Papers that are accepted will be published in the Congress proceedings and will provide input into the Congress sessions. All authors of accepted papers will present their work and results at interactive poster sessions. Some outstanding contributions will be selected for an oral presentation during the Congress.



CONTACT - INFORMATION

World Road Association (PIARC)
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For more information: <http://piarcabudhabi2019.org>



CONNECTING CULTURES
ENABLING ECONOMIES

6th to 10th October 2019

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PIARC PRIZES 2019

By submitting a paper in response to the present call for papers you will automatically be entered in the PIARC Prizes competition and be in contention to win one of the prizes. The prize for the best paper in each category will be awarded by an international jury.

For each paper selected for a prize, PIARC will pay travel expenses (economy class), accommodation (hotel - intermediate category) and registration fees to the Congress for one of the co-authors of the paper.

Each selected paper will be published in Routes/Roads, the quarterly magazine of the Association.

INFORMATION FOR AUTHORS

CONTENT - All papers must be **original work** available to be released for publication. Material that has been previously published will not be accepted. Any reference of a political, commercial or advertising nature must be excluded from the papers. The indication of a brand name should be excluded in the title and in the abstract.

LANGUAGE - Abstracts must be submitted in English for evaluation purposes, plus, if possible, in one or two of the other **working languages** of the Association, i.e. **French** and **Spanish**.

SUBMISSION - Abstracts should be submitted using the online facility from the dedicated congress website: <https://abstracts-abudhabi2019.piarc.org>

LENGTH - The abstract should not exceed 400 words.

TIMELINE

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| Deadline for submission of abstracts | 15 September 2018 |
| Notification of acceptance of abstracts | 31 October 2018 |
| Deadline for submission of full papers | 28 February 2018 |
| Notification of acceptance of full papers | 30 April 2019 |
| XXVIth World Road Congress, Abu Dhabi 2019 | 6-10 October 2019 |

Topics for the call for papers

Individual contributions are solicited for the following topics exclusively.
Papers that fall outside this scope will not be considered.

1. Impact of Disruptive Technologies on the Performance of Transport Administrations

The transportation of people and goods as we know it today is in for a dramatic change. New technologies are emerging at an accelerated pace while at the same time expectations and travel behaviour of our customers and stakeholders is also changing. The power of new technologies to connect us to one another and the emergence of sharing platforms is forcing transport industries to re-evaluate their current business-models.

The combination of the new sharing economy model and disruptive and innovative technologies such as connected and autonomous vehicle (CAV), on-demand ride sharing services, Mobility as a Service (MaaS), etc., will continue to drastically alter the landscape of how people travel, how they view mobility, how freight moves, and even have the potential of redefining what constitutes our transportation network.

We seek to better understand the ways in which innovative and disruptive transport system technologies will impact the performance of transport administrations.

Papers shall deal with the following topics:

- Opportunities for partnership: How can private sector and/or other public-sector entities partner together to create a complementary environment to test, evaluate, and implement a specific subset of new technologies;
- Opportunities for underserved population: How can the application of disruptive and other innovative transport system technologies create and enhance opportunities for transport administrations to be more inclusive of typically underserved populations?
- Capital planning and execution process: How to integrate long-range capital planning discussions with preparation for disruptive and other innovative transport system technologies and learn how transport administrations can adjust their infrastructure planning processes to accommodate rapidly changing technologies;
- Workforce impacts: How are these technologies going to impact the existing workforce of transport administrations; how can transport administrations begin preparing their workforce for these technologies.

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2. Digitization and its Effect on Performance of Transport Administrations

Digitization is a global trend with significant effect on all sectors including the transport sector. It influences on all part of transport administrations.

Digitization generates large amounts of information on traffic and infrastructure. Information is becoming a valuable asset and can generate new opportunities for decision making. As we collect more and more data, the challenge is to use that in a way that helps us create value for the organisation, improve our customers experience and the services we deliver.

How can transport administrations make use of and proactively meet the challenges and opportunities that digitization creates? How can Transport Administrations get access to data, share and use data? What should be the digital agenda of Transport Administrations?

Papers shall deal with the following topics:

- Stronger focus on improving customer experience through digital services;
- Data, digital services and tools for management and evaluation of performance of the organisation;
- The role of government versus private sector;
- Enhance the efficiency and effectiveness of corporate services;
- Digitization in planning, asset management, operations, construction and maintenance.

3. Economic History of Transport Systems

The space of road investment is complex and dynamical. It comprises many interconnected and fast-moving issues. This is particularly the case in the lower income countries.

Papers shall deal with the following topic:

- How have these systems evolved?

Topics for the call for papers

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4. Economic Measurement of Transport Systems

Let us refresh that the space of road investment is complex and dynamical. It comprises many interconnected and fast-moving issues. Pick a phenomenon and write a case.

Papers shall deal with the following topics:

- How does the dynamical reality affect the measurement of transport investment across the world?
- How does economic analysis relate to the mechanics of road funding and financing?
- Do certain financing mechanisms lead to more robust economic analysis?

5. Sociology of Transport Systems

Transport infrastructure and especially roads weave across societies. Those societies are bound on norms and values (i.e. institutions), and so transport interacts with the social institutions. We need to capture unique interactions. Only that way can we provide more socially sensitive infrastructure – and that social dimension eventually reflects in the economics of transport.

Papers shall deal with the following topic:

- Case studies capturing those interactions.

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6. Risk Management Practices in Organizations and Projects

Project risk management is a longstanding practice involving different approaches and tools. Enterprise risk management is an emerging field for the road transport sector as there are few road authorities and organizations that apply a comprehensive risk management framework across the entire organization.

This call aims at identifying innovative project risk management practices and tools for different phases of a project, from project initiation to operation and maintenance. It also aims at identifying worldwide experiences from the application of comprehensive risk management frameworks regarding innovative methodologies and tools for implementing and administering risk management in road organizations to facilitate informed and risk-based decision making.

Papers shall deal with the following topics:

- Innovative propositions and metrics for measuring or assessing the benefits arising from the implementation of the risk management framework at enterprise or project level;
- Interdependence of risk management framework with performance management and asset management.

7. National and Subnational Road Authority Cooperation in the Face of Transformation

National road authorities around the world are facing tremendous changes and challenges as the road transportation ecosystem changes and evolves. There are tremendous forces worldwide that particularly require national road authorities to rethink and reformulate how they cooperate and collaborate with subnational road authorities. Whether the force is rapid urbanization overwhelming metropolitan road transportation networks; or the restructuring and devolution of roles and responsibilities to local and regional governments; or the shortfall of funds for road administration; or the need for a more integrated and multimodal perspective; or transformative technologies like connected vehicles, autonomous vehicles, shared mobility or electric vehicles; the response must involve systems thinking that is more inclusive. The future transportation landscape will be different. At the end of the day, all actions are local and regional. How should national road authorities address such challenges in a coherent manner?

Papers shall deal with the following topics:

- Challenges and opportunities faced by national road authorities as they consider cooperation and collaboration with subnational road authorities to effectively address these issue;
- Possible approaches and relationships that would facilitate such cooperation and collaboration.

Topics for the call for papers

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8. New Business Models, New Organizational Models, New Technologies, New Applications - How Will ITS and Road Network Operations Evolve?

Several technical and economic breakthroughs have emerged in recent years. On a technical level, the Internet of Things, of which connected vehicles and probe vehicles are only a part, makes it possible to put road network operations in a broader framework aiming at optimizing not only the traffic with a standpoint to efficiency and safety but more generally a «system» including the road, the city and rurality with sustainable development objectives. Moreover, new information sources, such as social networks and sensors, are leading the entire market to provide new business and organizational models, taking into consideration also public-private-citizen partnerships.

Papers shall deal with the following topics:

- What is the impact of these changes on the quality of services provided, on their costs, on their resilience to adverse conditions such as natural disasters or malicious acts of all kinds, on privacy, security and regulation?
- What new services can be provided to road users and road operators?
- How is it possible to foster these evolutions in terms of new professions and training?
- What are the «open» points that could be further investigated and therefore direct research efforts through national or international programs?

9. Internet of Things, Big Data, Smart Cities, Smart Roads and Road Network Operations

Today we live in a world, where objects and people are getting more and more connected. Infrastructure operators are implementing different types of sensors and particularly in urban areas they inform us about the weather conditions, the level of pollution, the noise level, the energy consumption, the traffic flow, etc. Besides these traditional sensors every user is becoming a mobile sensor, particularly thanks to smartphones. In addition, emerging in-vehicle technologies, as well as related communication technologies, have the potential to drastically enlarge the mobility related data (connected and automated/autonomous vehicles are discussed all over the globe).

The interconnection of all these data makes it possible to have a detailed knowledge of the state of a vast vehicle-infrastructure-user system. Road network operations and traffic control will be impacted because it is now a complex system that we want to regulate in order to minimize pollution (including noise), travel times and to maximize security. On a technical level, we have new challenges to deal with, huge volumes of data generated by this multitude of sources that are often heterogeneous, asynchronous and whose reliability is not always demonstrated. Big Data-based techniques provide some answers. The Internet of Things provides the basis for Big Data analytics. Artificial Intelligence will be needed to process the big amounts of data too.

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Papers shall deal with the following topics:

- How will these emerging technologies influence and even change the core businesses of road network operators?
- What kind of cooperation between the public and private sector is needed to utilize the full potential of these emerging technologies?
- What is the potential for emerging operators in these new technologies?

10. Mobility as a Service and the Changing Role of Road Network Operators

Mobility as a service (MaaS) is one of the new principles for the mobility of the future, where travellers' expectations concerning their mobility needs will be covered by one service agreement between the traveller and one Mobility Operator. By achieving this expectation, the whole mobility system as it exists today will undergo a drastic change. It can be expected that one private or public Service Operator will provide access to the whole transport systems (including all modes of transport) including trip planning, booking, ticketing, etc. The traveller will get a complete door-to-door service without looking on the modes themselves, but only focusing on reaching his destination in time based on a mobility-package-contract. To achieve this vision, a change of the currently existing roles of transport operators for single modes is expected. Many emerging services supporting this MaaS vision already exist, other services are to come.

Papers shall deal with the following topics:

- How do road network operators need prepare themselves to contribute to MaaS?
- What does MaaS mean to road network operations in terms of technical but also organisational preparations?
- What are the new requirements towards road network operators?
- Which services are already existing today that will contribute to the MaaS vision?
- Will the future be data or service provision? Or will it be a combination of both?

Topics for the call for papers

Individual contributions are solicited for the following topics exclusively.
Papers that fall outside this scope will not be considered.

11. Transportation Management during Winter Events

Managing transport during winter events and informing users is an important function of road managers, the aim of course being to reduce the impact of adverse weather events on roads.

Papers shall deal with the following topics:

- What are the relationships, organizational structures and communications between network operators and service providers?
- What are the decision-making processes and analysis that led to their development?
- How do implemented policies integrate information management on network operations with service providers?
- How can infrastructure and equipment be used advantageously to facilitate operations. of the road during winter intervention?

Detailing or scoping the specific technologies that serve network operations and/or maintenance providers is not part of this call.

12. De-Icing Salt and Brines Treatments, Interventions and Best Practices

All types of networks and areas require winter service intervention. It is necessary to develop strategies, methods and techniques to fight against ice or snow, especially the spreading of de-icer, while considering environmental considerations.

Papers shall deal with the following topics:

- Criteria used to build a decision, decision algorithms and parameters used (temperature of the surface area of the dew point, state of the roadway, traffic, weather revisions, etc.);
- Case studies describing decision-making based on the road weather situation and the results obtained from a critical analysis.

Methods used to acquire the parameters (weather report, RWIS, etc.) and performance of equipment are out of scope of this call.

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13. How to Encourage Development of Public Transport Projects

Systems that prioritize public transport are very important in the organization of urban transport. However, implementation of transport projects can sometimes lead to traffic problems such as congestions in urban areas, despite the original intention to solve them.

Papers shall deal with the following topics:

- Policy on transport strategies, methods and operations, with the aim of solving current transport problems such as traffic congestion, demographic change and environmental impact;
- Implementation of such policies;
- Best practices in prioritizing passenger transport in coherence with general traffic, in order to optimize service, mitigate the impact of the road and avoid traffic congestion in particular.

Papers should offer the opportunity to discuss the best practices and prioritize the most effective ways to optimize transport services.

14. Organizing Transport Services in Commuting Areas

Large metropolitan areas are made up of many residential areas, and daily commute to the city can be long and costly for commuters. They often need to use individual modes of transport.

Papers shall deal with the following topic:

- Best practices in terms of organization of transport services to provide suburb residents with good transport options (costs for user, duration, comfort) for their long daily commutes, for access to jobs, education, etc.

Papers should distinguish two types of territory as a minimum (city centre and the rest of the commuting area) and detail the following for each type of territory: characteristics of the territories (area, population and jobs), available public transport (linear lines, number of stops, organization of transport chains, etc.) by type of territory, with a focus on the organization of multimodal nodes, transport demand (number of trips from home to work), and its distribution (modal split) by type of territory, administrative organization, costs incurred for users and the community.

Topics for the call for papers

Individual contributions are solicited for the following topics exclusively.
Papers that fall outside this scope will not be considered.

15. Best Practices in Terms of Multimodal Transit Nodes

Large metropolitan areas are composed of many residential areas, between which daily trips are usually done by car. Some metropolitan areas have developed an alternative to car users, with multimodal interchange nodes. They connect local public transport (metro, tramway, bus) with long-distance public transport services (rail, BRT on highways).

Papers shall deal with the following topic:

- Best practice on multimodal interchange nodes dedicated to long distance trips (from 10 to 100 km) within metropolitan areas.

Papers should describe characteristics of the territories, functions offered by the interchange node, daily traffic, number of people going from one mode to another (MRT, urban bus, BRT, etc.).

16. Policies for Promoting Multimodal Freight Transport and Logistics

Road freight transport's major economic contribution contrasts with its negative impacts in many countries. These include traffic congestion, negative environmental impact (noise, pollution), high energy consumption and use of non-renewable energy resources, contribution to climate change, GHG-emissions, safety and security issues, limited resilience of the road transport system and constrained funding resources regarding road network improvements and maintenance.

These negative impacts drive the promotion of national multi-modal freight and logistics policies. However, these policies are neglected or undervalued as compared to passenger transport policies. They often focus on a single mode and the integration between modes is not well addressed.

Therefore, it is very important to develop and implement freight transport policies aimed at an optimal use of different modes (road, rail, inland waterway, short and deep-sea shipping) and which form part of an overall transport strategy.

Papers shall deal with the following topics:

- Successful multimodal freight and logistics policies that have been implemented or are currently under development;
- Policy goals, policy instruments and measures, implementation process;
- Impacts of the policy;
- Success and failure factors.

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17. Truck Management on Highways

Road freight transport continues to increase in most countries but faces issues:

- Lack of road capacity as well as constraints on expanding the existing infrastructure often lead to bottlenecks that increase transport costs and have a negative impact on the reliability of the freight transport supply chain;
- On freight corridors' highways and motorways, truck-parking provision is often not sufficient to satisfy demand;
- Overloaded trucks can cause severe damage to the road infrastructure, safety problems, and induce unfair competition between truck companies and other modes.

Therefore, approaches for better management of road freight transport are needed. Possible management approaches are smart infrastructure access, smart truck parking management, platooning and part automation, monitoring and enforcement of weights, use of ITS/ICT to ensure the compliance with infrastructure and regulations.

Papers shall deal with the following topics:

- Innovative and successful truck management measures and policies, which have been implemented or are under investigation;
- Impacts, costs and benefits, success factors, implementation process;
- User acceptance;
- The role of government.

18. Greening Road Freight Transport

Transport contributed about one quarter of energy-related global GHG emissions and about one fifth of energy use in 2009. Road freight transport volumes over medium and long distances is increasing. This is due to sustained globalization, spatial division, increase in parcels demand, developing country growth and also to the high economic efficiency of road transport. This has a significant impact on fossil energy consumption and GHG-emissions. Many countries face the challenge to substantially reduce fossil energy consumption, CO₂ and pollutant emissions.

Therefore, it is very important to develop, evaluate and implement measures which increase the energy-efficiency of road freight transport including the use of alternative fuels, e.g. electricity or hydrogen. Such measures can be technical, operational, logistics related, regulatory and infrastructure based.

Papers shall deal with the following topics:

- Innovative and successful measures for greening road freight transport, which have been implemented or are under investigation;
- Impacts, costs and benefits, success factors, implementation process;
- User acceptance and incentives.

Topics for the call for papers

Individual contributions are solicited for the following topics exclusively.
Papers that fall outside this scope will not be considered.

19. The Role of the Infrastructure in Road Safety: Past, Present and Future

Infrastructure has played a key role in the economic development of each country. Road infrastructure is the mode of transport that carries most people and goods, while also accounting for the vast majority of transport-related fatalities. The level of death and injury is unacceptable in today's society. Through the ages, there have been a set of trends, needs and pressures that has forced road infrastructure to evolve and adapt, up to the infrastructure as we know it today. Going forwards there is the need for road infrastructure to follow the safe system approach. That is the forgiving road concept that accepts human error and recognizes that, although accidents cannot be completely avoided, it is not acceptable for anyone to die or be seriously injured as a result of a road accident. Papers shall deal with the following topics:

- Historical perspective of the road infrastructure, its context and evolution, from a road safety point of view;
- How will trends in mobility – electric, autonomous, connected and shared-used vehicles – impact road safety?
- How should we manage the transition from forgiving roads to smart roads?

20. Analytical Methods for Road Safety Programme Policy and Investment Decision-Making

The WHO Global Targets for Road Safety provide a framework for action and investment worldwide. The UN Road Safety Trust Fund and similar dedicated Safer Roads Funding at the national and state level in leading countries provides a mechanism for a scaling up road safety action worldwide. Ensuring that new investment is well-targeted and maximizes lives saved is a focus for all agencies.

Road safety programmes that use appropriate safety management methods to analyse, evaluate and diagnose road safety problems are more likely to realize a reduction in crashes for a given road safety investment. Maximising the return on investment requires consideration of how these crash reduction interventions target crash potential, and how different modes and road users might be impacted by these improvements. The papers should also consider the need to maintain and operate these safe system assets, and how to measure success.

Papers shall deal with the following topics:

- Financing, planning, design, and operation of road networks to reduce crashes through strong safety programmes;
- Analytical methods for safety programme policy, investment and decision making, particularly in terms of the needs of vulnerable road users, impact on transportation system performance and asset management.

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21. Multiagency Responses to Deliver *Safe System* and *Vision Zero* Outcomes

Significant improvements in road safety, including efforts towards a “*Safe System*” and “*Vision Zero*” solution, can only be achieved by recognizing that a safe roadway environment is a shared responsibility, involving several public agencies including the police, the road authorities, road safety educators, among others. Coordinated and strategic efforts by public agencies that are interested and responsible for road safety will yield greater safety benefits as compared to individual agency efforts that are undertaken in isolation

Papers shall deal with the following topics:

- Real-world projects that use a multi-disciplinary approach to road safety, with a focus on the protection of vulnerable road users and opportunities for road safety coming from new technologies;
- Analysis of the benefits associated with the compounding impacts as a result of a multi-disciplinary approach to road safety.

22. Barriers to Effective Road Safety Audit

Road safety audits are a very effective way to address road safety concerns at the project level. PIARC have developed guidelines including consideration for low and middle income countries.

Papers shall deal with the following topics:

- How to establish a good link between client and auditor?
- How to accelerate getting the legislation in place?
- Examples of costs for audit stages (viewed as costly) and effective examples;
- Development of training courses and how to foster experienced auditors;
- Ensuring consistency and quality of auditors when different criteria are in place;
- How to get designers buy-in in how people use the delivered project?
- How do LMIC address road safety audits and ways to increase uptake?

Topics for the call for papers

Individual contributions are solicited for the following topics exclusively.
Papers that fall outside this scope will not be considered.

23. Technical Security Measures for the Protection of Infrastructure

Various operators and administrations have to deal with constantly evolving threats and vulnerabilities, and need continuously updated technical solutions for that.

Every infrastructure can be a location for various criminal or illegal trafficking acts, and can be the site of incidents using vehicles as instruments of destruction whose target are everyday people.

Potential targets and critical infrastructure are very diverse: tunnels, bridges and viaducts, as well as control centers, urban spaces with their buildings, malls, libraries, open spaces and concert locations. Other relevant vulnerable assets can be the last mile to airports, ports and intermodal platforms.

Terrorist/criminal acts can also involve means of transport (planes, metro, trucks and vehicles) also as “weapons” to amplify the devastating effect of the act, especially if transporting dangerous goods.

More recently, cyber-attacks can be aimed at the information system of public/private organizations, thus producing always-evolving vulnerabilities. In the near future new risks can come from the self-driven and connected vehicles.

Papers shall deal with the following topics:

- New technical security measures that provide a resilient attitude when faced with such unpredictable events;
- Analysis of security risks for transport services and infrastructure;
- Best practice examples.

24. Best Practices in Road Asset Management

Road infrastructure represent a key public asset in most countries. Therefore, asset management is a well-established discipline which is successfully implemented in several countries, for management of highways as well as other physical assets. PIARC has developed various reports on this topic, as well as a comprehensive online manual on road asset management.

Traditional methods of managing assets must progress to meet the requirements and constraints of the 21st century. It aims at addressing demands of a nation’s citizens and industry for greater accountability and transparency, more efficient use of funds, greater focus on customer expectations and more sustainable solutions.

Papers shall deal with the following topics:

- Case studies that describe practical experiences of an organisation/administration in the field of road asset management;
- Solutions in road asset management that are successfully implemented in practice. The examples can range from already widely accepted to rather innovative methods;
- Education and dissemination programs on asset management.

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25. Green Paving Solutions

Sustainability in road construction is a top-level priority and is still gaining interest. The path to realize this in practice is not always clear and implementing green paving solutions on a wider scale remains a challenge. Green Procurement strategies also facilitates integrating green paving solutions.

It is also important to integrate sustainable solutions at all life cycle stages, from design, to construction and use stage, till the end of life of the road.

Sustainability assessment of green paving techniques can be done by a wide range of tools, from carbon footprint tools or LCA analyses, focusing on environmental indicators, to rating tools, taking also financial and/or social criteria into consideration.

Papers shall deal with the following topics:

- Case studies of methods and materials that minimize the use of natural resources, reduce energy consumption and emissions, or improve safety are needed;
- Best practices in promotion green solutions within the road sector;
- Identification of challenges and barriers;
- Incentive strategies.

26. Optimization of Road Design and Construction

Road optimization includes actions at every stage of the project.

Papers shall deal with the following topics:

- Best practice of pavement engineering at all stages - material selection, design, construction and even in-use;
- Best practice of re-use and recycling of pavement materials, use of local materials and optimal design of low cost pavements;
- Case studies of strategies or policies that minimize the use of natural resources, reduce energy consumption and emissions, or improve safety;
- Technologies and best practices for low cost pavements;
- Technology and its implementation for re-use and recycling of pavement materials and use of local materials.

Topics for the call for papers

Individual contributions are solicited for the following topics exclusively.
Papers that fall outside this scope will not be considered.

27. Innovative Road Condition Monitoring

Monitoring of road condition is key to ensuring the serviceability and long life of road pavements. By providing monitoring data, pavement engineers can extend the road's life. Various information and artificial intelligence technologies can be used. A continuous challenge there is to use all road condition data in a rational way.

Papers shall deal with the following topics:

- Case studies of methods and materials that minimize the use of natural resources, reduce energy consumption and emissions, or improve safety are needed;
- New innovative monitoring techniques and methods;
- Best practice in using data.

28. Taking Future Inspection and/or Maintenance into account during Bridge Design Process

The principle of designing bridges with future inspections and maintenance in mind has often been the shortcoming of many bridge designs in the past, with a greater emphasis being placed on fulfilling the immediate need and minimizing the initial capital cost. In many instances, this approach has resulted in costly future maintenance which far exceeded the initial capital savings.

This issue has proven to be a problem in many developed countries with aging bridge infrastructure, and possibly soon to be a problem in developing countries.

Papers shall deal with the following topics:

- Conceptual and detail design considerations, standards and/or practices for the future performance of bridges with regards to inspections or maintenance;
- Provisions on bridges for safe access for inspections or maintenance;
- Case studies detailing innovative methods and technologies used to improve access to existing bridges for inspections or maintenance.

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29. Decision Process for Selection of Rehabilitation Type Considering both Technical and Economic Factors

Every bridge owner who has a degraded bridge needs to decide at a certain moment what to do:

- maintain the bridge in current condition (if safety is guaranteed) with low impact on the traffic or other functionality;
- perform minor repair with a small influence on the bridge life time;
- realize an important rehabilitation with a substantial extension of the bridge life time;
- reconstruct a new bridge.

Papers shall deal with the following topics:

- Specific procedure to compare different solution regarding technical and economic aspects including user costs;
- Case history of a bridge rehabilitation where different options were compared;
- All related subjects.

30. Damage Assessment on Bridges

Bridge owners routinely need to assess bridge damage and deterioration to ensure the safety of the traveling public and appropriately manage the service life of a bridge. While in service, bridges experience a variety of damage and deterioration modes including impact, corrosion, fatigue, cracking, fracture, unanticipated loading from natural disasters or extreme events, and construction defects.

Papers shall deal with the following topics:

- Case study or technique for damage assessment used by bridge owners or team;
- Decision process including “triggers” in which an event occurred and the steps the owner or team took to ensure the bridge was safe to carry the traveling public;
- Techniques and methods in which damage and deterioration is applied to structural evaluation models to determine the load carrying capacity.

Topics for the call for papers

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31. Case Studies and Innovations for the Future on Use of Local Materials on Earthworks

Environmental policies and considerations promote the use of larger amount of local materials, including natural soils, industrial byproducts and waste as well as reuse and recycling of road materials.

The exchange of experiences and case studies is essential to the progress on this field.

Papers shall deal with the following topics:

- Experiences on the use of local materials on earthworks and current paths of research for the future;
- Environmental considerations as well as the effects on maintenance;
- Real case studies and laboratory research or tests;
- Successful practices are welcome; unsuccessful ones with lessons learned are even more interesting.

32. Information Technologies for Earthworks

Current development of Information Technologies (IT), robotics and artificial Intelligence open new possibilities for earthworks.

Papers shall deal with the following topics:

- Innovative use of IT on instrumentation of earthworks and unpaved roads;
- New equipment for a higher automatization of works (autonomous machines, robotic tasks, etc.);
- Data collection and analysis for the use on earthworks (including Big Data, innovative use of satellites, etc.).

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33. Innovative Approaches for Rural Roads and Rural Connectivity

Rural road networks provide connectivity to more than 1 billion people around the world, offering them access to services (hospitals, schools, etc.), access to jobs and productive areas, allowing them to bring their products to the markets and to receive products. These communities are generally the most vulnerable and with less resources within their respective countries.

Papers shall deal with the following topics:

- Innovative approaches on asset management of rural roads;
- Innovative approaches on financing and funding of rural roads programs;
- Innovative approaches on involvement of local communities on the management, building and maintenance of rural roads, and/or microenterprises programs associated to rural roads and microenterprises specialized on road maintenance;
- Raising the importance of rural roads for social and economic development;
- Impact of digitalization on rural connectivity.

34. Road Tunnel Operations and Safety Issues related to the Development of Intelligent Transportation Systems (ITS)

The last few years have seen considerable technological advances in the field of transport infrastructure, including Intelligent Transportation Systems. In a road tunnel environment, these systems can have a significant impact on operation and user safety.

Papers shall deal with the following topics:

- Given the very quick development of ITS on open roads, how can service continuity of such systems be guaranteed in the specific context of road tunnels?
- What are the tunnelling community's expectations with regards to these ITS: safety distance control, lane departure warning systems (LDWS), heavy vehicle guidance systems, vehicle localization and counting systems, identification of hazardous goods vehicles...?
- More generally speaking, how can these ground-breaking systems improve user safety in road tunnels?

Topics for the call for papers

Individual contributions are solicited for the following topics exclusively.
Papers that fall outside this scope will not be considered.

35. Road Tunnel Operation and Safety Issues related to the Development of New Propulsion Technologies

The last few years have seen considerable technological advances in the field of road transport, including the emergence of new propulsion technologies. In a road tunnel environment, these new technologies have a potentially significant impact on user safety.

In general, the overall number of registered vehicles using alternative fuels remains small. However, the tunnel community has a relative lack of knowledge of the potential consequences of incidents involving alternative fuel vehicles and related phenomena.

This technical session will focus on the impacts of new propulsion technologies on road tunnel operations and safety and will discuss the many and varied types of alternative fuels now being explored in the industry. Examples include hydrogen, liquefied natural gas (LNG), compressed natural gas (CNG), biodiesel, ethanol and electric vehicles.

Papers shall deal with the following topics:

- Additional risks of new propulsion technologies for tunnel users;
- Difficulties in taking possible consequences of new propulsion technologies into account in safety management systems;
- Difficulties in providing appropriate information and establishing intervention strategies for emergency response teams.

36. Methodological Approaches and Tools for Climate Change Adaptation of Roads

PIARC has developed a climate change adaptation framework for roads, and is looking for strategies and case studies to increase the resilience of roads to climate change effects and extreme weather.

Papers shall deal with the following topics:

- Data requirements, methodologies and approaches for collecting data and information relevant to climate change adaptation of road infrastructure;
- Methodologies and approaches for vulnerability and criticality assessments of road infrastructure with regards to possible impacts resulting from climate change (project and system level);
- Adaptation measures with regards to different possible impacts resulting from climate change;
- Cost benefit analyses with regards to the adaptation of road networks to climate change and extreme weather.

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37. Frameworks for Climate Change Adaptation of Roads

In the field of adaptation of roads to climate change and related weather extremes, risk management approaches at network level have been developed and used, such as PIARC's International climate change adaptation framework for road infrastructure

Papers shall deal with the following topics:

- Examples of the implementation of risk management approaches at network level with the aim to identify, propose and prioritize the most appropriate measures and to mitigate risks associated with climate change and/or extreme weather events r; as well as suggestions and conclusions from these implementations;
- Results and suggestions from simulations and exercises, where existing risk management approaches have been assessed on national, regional or local level;
- Benchmarking of existing risk management approaches for the adaptation of roads to climate change and/or extreme weather.

38. Environmental Considerations in Road Projects The Need for Resilient Communities

Roads should be designed and operated in a manner that ensures the delivery of tangible environmental outcomes. There is an increasing body of evidence that roads might cause significant adverse effects on the environment, health and economy of local communities, which has prompted governments, road administrations, public health organizations and environmental authorities to seek policy, engineering and management solutions that reduce adverse environmental and public health impacts and risks whilst still meeting the requirement for mobility.

Environmental issues such as air pollution from vehicles and traffic noise have often focused on just achieving minimum standards of regulatory compliance, so there is a significant challenge to the road industry to ensure environmental considerations mirror the innovative engineering infrastructure and traffic operation solutions now being delivered by many Road Administrations. With poor air quality and noise from transport being responsible for the loss of around 3 million disability adjusted life years in Europe alone (the standardized measure of healthy years of life lost to illness, disability or early death), this session will present examples of policies and measures to improve the health of local communities; strengthen land use and transport planning and monitor environmental indicators of performance as well as identifying opportunities for future research.

Papers shall deal with the following topics:

- Examples of policies and measures to improve the health of local communities;
- Examples of policies and measures to strengthen land use and transport planning;
- Examples of policies and measures to monitor environmental indicators of performance;
- Opportunities for future research.

Topics for the call for papers

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Papers that fall outside this scope will not be considered.

39. Improvement of Disaster Management Based on Experiences of Recent Major Disasters

Road authorities generally improve their disaster management systems from their experiences of past major disasters. The frequency of such major disasters is low in nature, and hence it is important for authorities to share their experiences of coping with major disasters. It is essential to exchange international best practice on the improvement of road disaster management systems based on major disaster experiences, including those disasters where the management capacity of the road infrastructure was exceeded.

Papers shall deal with the following topics:

- Good practice of road disaster management for major disasters and emerging problems;
- Analysis of the methodology of problems associated with road disaster management;
- Improvement of road disaster management systems and their implementation;
- Evaluation of improved road disaster management systems in subsequent disasters, including any computer simulation and other evidence of benefits and costs.

40. Role of Social Networks in Disaster Response Management

An emergency is a critical situation for any road administrator. If an emergency event is not suitably managed, then it will have a negative impact on the road administrator. In order to improve an organization's response to an emergency, management technology and frameworks have been developed mainly based on experiences.

Currently any emergency information regarding an incident, accident or disaster can be easily obtained not only through conventional media but also through web media and social networks. Information directness, diversity and speed from web media and social networks is very powerful compared to conventional media, and currently many road administrators tend to place an emphasis on information management in an emergency through web media and social networks.

Papers shall deal with the following topics:

- Best practice in information and communication management;
- Examples of usage of web media and social networks in case of emergency for road administrators.

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41. Road Infrastructure Resilience

In addition to the normal operation of road networks, additional challenges for owners and operators of road infrastructure will arise. These include:

- Aging infrastructure, state of repair (especially bridges and other engineering structures);
- Climate change and extreme weather events (e.g. heavy rain, storms, heat-waves);
- Natural disasters (e.g. landslides, floods, storm damages, wildfires, earthquakes);
- Man-made disasters (e.g. terrorist attacks, very large accidents with or without involvement of dangerous goods);
- Cyber and cyber-physical threats (e.g. tunnel and traffic control centers).

Road owners and operators must address these key challenges to ensure a reliable operation of their road networks, mobility and supply chains. As compared to traditional risk management, the concept of resilience is a more comprehensive and generic all-hazard approach, which starts well ahead of possible events (prepare, prevent, protect) and in particular also includes the phase after the occurrence of the event (respond, recover).

Papers shall deal with the following topics:

- Methodologies and approaches for (all hazard) resilience management;
- Case studies on resilience engineering.



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