

## PIARC (World Road Association) Strategic Plan - 2024-2027

### Technical Committee 2.5 – Road Infrastructure for Connected and Automated Mobility

#### Overview

The ways of moving passengers and goods are changing rapidly in cities, metropolitan areas and rural areas not only due to the continued advancement of technology, including connectivity, cooperative and automated systems, but also because there is a need to increase utilization of the technology.

Road authorities and operators must be clear about the impact that this new mobility has on their current responsibilities and performance and prepare the necessary policies and safety standards for the future. Knowing what may happen, and the opportunities arising, and the demands required from the infrastructure by this new mobility will help road authorities and operators determine more efficient actions and investment decisions.

New scenarios and business models are evolving which require new architectures and ways of working. Decision makers need to consider this new environment to enable decarbonisation and improve safety and efficiency in the road and transport sector.

Three main topics have been identified for the Technical Committee to consider:

- Roads for connected, cooperative and automated mobility, considering both physical and digital infrastructure.
- Automated driving and infrastructure.
- Architectures, (including the role of managers and security issues) and business models for public authorities and road agencies (including partnerships with industry).

The reports developed by PIARC TF B.1 on connected vehicles, TF B.2 on automated vehicles, TF 2.1 on new mobility and its impact on road infrastructure, and the Special Project on smart road classification must be taken into account and provide a good starting point for the technical committee. Collaboration with TC2.4 has been identified as an essential activity.

#### 2.5.1 Roads for connected, cooperative and automated mobility

**Purpose:** The purpose of this work is to identify the characteristics and functionalities that roads must provide to enable connected, cooperative and automated mobility. These characteristics and functionalities include both the physical infrastructure (signal, road markings, etc) and the digital road infrastructure (digital road signs, etc), studying the pros and cons of the different technologies available depending on the different scenarios and context.

#### Preliminary research questions:

- What physical requirements must a road to enable connected cooperative and automated mobility?
- What digital/connectivity requirements must a road to enable connected cooperative and automated mobility?
- What challenges and opportunities do connected, cooperative and automated mobility present for road authorities and operators?
- Regarding the legal and regulatory framework: What is the legal and regulatory situation (state of the art worldwide) associated with connected, cooperative and automated mobility infrastructure?

- Is there an intention to have standard requirements to accommodate all technologies? How can we avoid having an infrastructure for a specific technology?

**Importance to roads agencies:** This work should be important to road agencies/road industry because connected, cooperative and automated mobility is a reality that is growing in importance due to its contribution to improving road safety and enabling decarbonization and the efficiency of the transport system.

Road agencies are aware of this opportunity and must direct their policies and activities to successfully incorporate connected, cooperative and automated mobility. It is necessary to start thinking about it now and plan as they are working on infrastructure, taking a proactive approach rather than retrofitting when the technology is ready for deployment.

Road agencies might consider undertaking their own safety assessment of the technologies in their own context and environment to gain a clear understanding of what they are implementing (3<sup>rd</sup> party, information needed for insurance and liability reasons).

**Audience:** The first main audience of the work of the technical committee should be the members of the national committees, responsible for defining the national policies on roads and transport. But, the TC work should be of interest and useful for any technician who wants to know the state of the art, and the characteristics and performance of roads in relation to connected, cooperative and automated mobility.

**Deliverables:** Literature review, technical report, case studies, survey, high impact summary, article in Routes/Roads magazine, seminar, social media, session in an external conference.

**Background to TC's work on this topic:** The reports produced by PIARC TF B.1 on connected vehicles, TF B.2 on automated vehicles and TF 2.1 on new mobility and its impact on road infrastructure must be taken into account and can constitute a good starting point for the technical committee.

**Low and lower-middle income countries:** The conclusions and recommendations of the technical committee may be especially relevant for LMICs since they can acquire knowledge and experience prior to their interventions without the need to use their own resources, enabling more efficient investment.

**Gender inclusion & diversity:** The technical committee should take into account gender inclusion and diversity issues through three main channels:

- Collecting gender aggregated data to analyse when possible.
- Analysing gender and age group differences in connected, cooperative and automated mobility acceptance if disaggregated data are available.
- Considering differences between men and women in safety and security concerns when disaggregated data is available.

**Potential duration:** This topic will be covered during all the cycle 2024-2027.

### 2.5.2 Automated driving and infrastructure

**Purpose:** The purpose of this work is to:

- Identify the impact of automated driving on road infrastructure, and to consider what may be needed for the future.
- Identify the physical and the digital requirements.

- Identify the challenges and opportunities for road operators and administration due to automated driving.

**Preliminary research questions:**

- How will road networks need to evolve as a result of automated vehicles?
- Would a specific road network for automated driving be required?
- Regarding infrastructure adaptation: How should existing infrastructure be modified or upgraded to accommodate automated mobility? Are we going to have dedicated lanes for automated driving in the general road network?
- What are the physical/digital requirements in a road for automated driving?
- Regarding the appropriate Operational Design Domain (ODD): How to define and establish the appropriate ODD for different types of Automated Vehicles. This involves understanding the capabilities and limitations of AVs and identifying the conditions (e.g., road types, weather conditions, traffic density) under which they can operate safely.
- Is there an intention to standardise requirements to accommodate all technologies? How can we avoid having an infrastructure for a specific technology?

**Importance to roads agencies:** This work should be important to road agencies/road industry because automated driving is acquiring an important role due to its contribution to improving road safety, the goal of decarbonization and the efficiency of the transport system.

Road agencies are aware of this opportunity and must direct their policies and activities to successfully incorporate automated mobility, now or plan for the future.

**Audience:** The first main audience of the work of the technical committee should be the members of the national committees, responsible for defining the national policies on roads and transport. But the TC work should be of interest and useful for any technician who wants to know the state of the art and the characteristics and performance of roads in relation to connected, cooperative and automated mobility.

**Deliverables:** Literature review, technical report, case studies, survey, high impact summary, article in Routes/Roads magazine, seminar, social media.

**Background to TC's work on this topic:** The reports produced by PIARC TF B.1 on connected vehicles, TF B.2 on automated vehicles and TF 2.1 on new mobility and its impact on road infrastructure, and the Special Project on smart road classification will be taken into account, constituting a good starting point for the technical committee.

**Low and lower-middle income countries:** The conclusions and recommendations of the technical committee may be especially relevant for LMICs since they can acquire knowledge and experience prior to their interventions without the need to use their own economic resources, enabling more efficient investments.

**Gender inclusion & diversity:** The technical committee should take into account the gender inclusion and diversity issues through three main channels:

- Collecting gender aggregated data to analyse when possible.
- Analysing gender and age group differences in automated driving acceptance if disaggregated data are available.
- Considering differences between men and women in safety and security concerns when disaggregated data is available.

**Potential duration:** This topic will be covered during all the cycle 2024–2027.

### 2.5.3 Architectures and business models for public authorities and road agencies

**Purpose:** The purpose is to analyse the scope of architecture applied to road infrastructure for connected and automated mobility, considering first of all the different actors involved and their roles, starting from the design, planning and implementation of the architecture. In the analysis it is necessary to consider the different configurations of the domains where it will be applied, ranging from countries with different income levels, institutional aspects, local regulations, technological starting level or possible additional issues.

In the role of the architecture, it is necessary to include a specific analysis for security aspects, considering the implications that this aspect has on the correct development of the implementation and integration.

Otherwise, and regarding horizontal issues, it is convenient to carry out an analysis of the options for business models for connected and automated mobility with a focus on public authorities. The work will consider the current existing models, current and future trends, and other relevant aspects. such as income levels, current state of technology, possibility of evolution and development, and advantages/disadvantages of model changes. The options for partnerships will also be addressed.

#### **Preliminary research questions:**

- Can common/unified architecture elements for connected and autonomous mobility be established?
- How are the roles in the different phases of the architecture distributed in order to achieve a correct development?
- How are responsibilities distributed, taking into account the profile of the managers?
- How to take security aspects into account in the architecture?
- What are the aspects to consider in the analysis and proposals on business models for public authorities?
- Is it possible to define business model standards or an adaptation / change procedure related to connected and autonomous mobility?
- How can the field of partnerships be approached from an integral point of view?
- What implication do the possibilities of partnerships have in terms of the automotive sector?

**Importance to roads agencies:** This topic may have relevance for road agencies because the architecture phase is one of the most critical aspects in the consideration of Road infrastructure for Connected and Automated mobility. In addition, the development and application of business models represents an aspect that is fully related to the responsibilities inherent to functions carried out by road agencies. The integration of partnerships with industry also represents another aspect to consider and its conclusions and results obtained can provide added value to these agencies. An useful source of information would be a compilation of: good practices, success stories, experiences implemented and problems detected for possible analysis, assessment, identification of similarities or aspects for improvement.

**Audience:** The first main audience of the work of the technical committee should be the members of the national committees, responsible for defining the national policies on roads and transport. The architecture aspect and business models arising can involve a relevant number of actors, agents, and stakeholders, it will therefore be of interest to share the results with the different stakeholders.

**Deliverables:** Literature review, technical report, case studies, survey, high impact summary, article in Routes/Roads magazine, webinar, seminar, social media, session in an external conference.

**Background to TC's work on this topic:** The reports produced by PIARC TF B.1 on connected vehicles, TF B.2 on automated vehicles and TF 2.1 on new mobility and its impact on road infrastructure must be taken into account and can constitute a good starting point for the technical committee.

In this topic, the relationship with other TCs will be relevant.

**Low and lower-middle income countries:** The conclusions and recommendations of the technical committee may be especially relevant for LMICs since the information related to architectural aspects and the business models can be studied, analysed and projected prior to the possible investment to be made and based on the shared experience.

**Gender inclusion & diversity:** The technical committee should take into account the gender inclusion and diversity issues through three main channels:

- Consideration of gender inclusion & diversity in the business model and prior to decision making.
- Consideration of specific gender inclusion & diversity issues can be especially critical in the architecture phase, and should therefore be given special consideration throughout the entire treatment phase.
- Compilation of previous experiences in other business models

**Potential duration:** This topic will be covered during all the cycle 2024–2027.