

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

TECHNICAL COMMITTEE 4.5 – DECARBONIZATION OF ROAD CONSTRUCTION AND ROAD MAINTENANCE

Overview

The work of TC 4.5 will aim at five topics: improving logistical and technological decarbonization efficiency of road construction projects, new technologies for the measurement and inspection of road decarbonization initiatives, decarbonizing road construction project logistics, decarbonization of construction and maintenance equipment, carbon calculators. Issues will include the real-world impact on decarbonization of road construction and maintenance at all stages of road projects. The work will focus on the identification of the issues that have a carbon impact in projects during the road construction and maintenance phase. Identification and assessment of logistical and technological inefficiencies of projects and a proposal for mitigating these problems will be made on the basis of case study analysis as well as literature studies and surveys. An important issue in terms of assessing the effects of decarbonization will be the work on identifying decarbonization indicators and measures based on best practice analysis. An important element of the work will also be to identify logistical issues related to the provision of materials, the type of equipment and technology required for a road construction project in view of carbon emissions. The work will also result in identifying carbon calculators and determining the feasibility of building a PIARC calculator with AI. The results of the work in the form of briefing notes and other PIARC documents will go not only to LMICs, but also to countries that are starting or have not yet started decarbonization activities.

4.5.1 Improving logistical and technological decarbonization efficiency of road construction projects and maintenance

Purpose:

- Identify logistical and technological road construction and operational inefficiencies in current road projects, taking into account the materials used and their processing technologies;
- Assess the impact of identified inefficiencies on decarbonization;
- Propose measures to mitigate the impact of identified inefficiencies.
- Incorporate outputs from other TCs including within ST4.

Preliminary research questions: The analyses will be based on selected and completed projects from different countries that are able to prepare such data and should answer the questions:

- What decarbonisation solutions were used?
- What decarbonisation features (such as materials or components, and their processing technologies) were included in the designs (for various road infrastructure types and assets i.e. tunnels, bridges, structures, pavements, furniture etc) during the construction phase?
- What decarbonisation features were included in the designs during the maintenance phase?
- Are the recommended decarbonisation measures measured and are they consistent with the objectives?
- What recommendations can be introduced into the design stage on the basis of the projects analyzed with regard to reduction of the carbon footprint for pavements, decarbonisation of earthworks (construction and maintenance), sustainable operation of tunnels in terms of the new approach?

Importance to roads agencies: This work is important for road agencies and the road industry as it provides an briefing note of logistical and technological roadway construction and operational decarbonization practices in the context of actual projects. Through the case-study approach, agencies may be able to implement corrective actions in their portfolio of pending projects.

Audience: The Briefing note will benefit both the road administration and the road industry. It will allow them to position their design intentions in relation to good practice projects. The examples analysed will also inspire action.

Deliverables: Technical report, workshop or conference, social media, guideline including the collected information from all TCs in the scope of ST4. Contribution to Symposium SURF organized by TC 4.1.

Background to TC's work on this topic: Carbon Neutrality of the Road Sector. A PIARC special project. 2023. Results of TC 4.1's work on the topic "Reducing the carbon footprint for pavements" in the form of a Literature review and Case studies – expected completion by TC 4.1 end 2024. Results of TC 4.4's work on the topic "4.4.1: Sustainability of tunnel operation: new approaches" in the form of Briefing note.

Low and lower-middle income countries: The work will be dedicated not only to LMICs but also to countries with little or no decarbonisation efforts. The results of the work will give the best current examples (good practices) implemented by countries with a high decarbonisation approach.

Gender inclusion & diversity: The work does not directly relate to gender and diversity aspects. It will, however, indirectly relate to these effects when analysing projects. Reducing the carbon footprint from construction and maintenance should have an impact on improving the lives of people including women children on a regional and global scale.

Potential duration: 2024–2026.

4.5.2 New technologies for the measurement and inspection of road decarbonization initiatives

Purpose: The aim of this work is to identify technology and best practice that allows road managers to assess whether their decarbonisation targets are being met. This work will also identify decarbonisation indicators and measures based on literature analysis and practical applications in PIARC countries(including national guidelines).

Preliminary research questions:

The work should answer questions on:

- What are the new carbon measurement and control technologies for all road-related activities?
- How are the new measurement and inspection technologies applied?
- What are the methods for inspecting the carbon footprint during road design, construction and maintenance?
- What indicators and measures of decarbonisation are used in the literature and national guidelines?

Importance to roads agencies: This work is important to road agencies and road industry because it will point to new measurement and inspection methods of decarbonisation. It will also enable the assessment of decarbonisation targets for the measures and indicators set.

Audience: The audience of the work will be the road administration and road industry as well as experts assessing the degree of decarbonisation. The benefit will be to be able to identify new measurement and inspection technologies in projects, taking into account the indicators and measures identified.

Deliverables: Literature review, case studies, survey, briefing note, workshop or conference, social media.

Background to TC's work on this topic: Carbon Neutrality of the Road Sector. A PIARC special project. 2023. REGULATION (EU) 2020/852 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 June 2020 on the establishment of a framework to facilitate sustainable investment and amending Regulation (EU) 2019/2088.

Low and lower-middle income countries: The work should enable the selection of the type of decarbonisation measurement and inspection technology for LMICs countries. It should also allow the selection of the best measures and indicators to use depending on the sophistication of the decarbonisation approach.

Gender inclusion & diversity: The work does not directly address gender and diversity aspects. However, it will indirectly relate to identifying the effects of decarbonisation and will indirectly improve the lives of people, including women and children, regionally and globally.

Potential duration: 2024–2027.

4.5.3 Decarbonizing road construction project logistics

Purpose: The purpose of this work is to identify the issues of planning, coordinating and overseeing all activities related to the provision of materials, equipment and labour required for a road construction project in terms of carbon emissions. Road construction logistical topics such as the impact of design choices on hauling distances, routes and equipment mobilization

Preliminary research questions:

The work should answer questions on:

- What part of the project's impact on carbon emissions during the construction and maintenance phases may be directly linked to logistical constraints?
- What role did design choices play in logistical constraints impacting carbon emissions?
- What role does supervision and coordination of construction and maintenance of the project play with carbon emissions?
- How do we link issues of timeliness, cost and quality of work during construction with carbon emissions?

Importance to roads agencies: This work is important to road agencies/road industry because it will point to new measurement and inspection methods of decarbonisation. It will also enable the assessment of decarbonisation targets for the measures and indicators set.

Audience: This work is important to road agencies/road industry because it points out the most important issues concerning logistics during road construction and maintenance in terms of carbon emissions. It also points to the possibility of linking issues of timeliness, cost and quality of work during construction with carbon emissions.

Deliverables: Literature review, case studies, survey, briefing note, workshop or conference, social media, guideline.

Background to TC's work on this topic: Carbon Neutrality of the Road Sector. A PIARC special project. 2023.

Low and lower-middle income countries: The work should make it possible to identify the best solutions and good practices for the logistics of road construction projects in terms of carbon emissions. LMICs will be able to incorporate selected solutions into their practice, depending on the level of sophistication of their carbon footprint analyses.

Gender inclusion & diversity: The work will have gender and diversity implications, as in many cases poor project logistics will expose people to increased carbon emissions. This may affect women and children in particular.

Potential duration: 2024–2027.

4.5.4 Decarbonization of construction and maintenance equipment

Purpose: The aim of this work is to identify decarbonisation opportunities depending on the type of equipment (ordinary and special equipment) and the associated categories of works. The work also refers to the possibilities to limit construction and maintenance activities, i.e. electrification, low and zero emission vehicles (electric, hydrogen) and the use of alternative fuels (renewable diesel, etc.).

Preliminary research questions:

The work should answer questions on:

- What is the impact on carbon emissions of equipment during construction?
- What is the impact on carbon emissions of equipment under maintenance?
- What is the carbon impact of disposing of equipment after use?
- What is the carbon footprint of the various work groups, mainly earthworks?
- What opportunities exist to reduce carbon emissions and effectively decarbonise construction equipment?

Importance to roads agencies: This work is important to road agencies and road industry because it will point to new measurement and inspection methods of decarbonisation. It will also enable the assessment of decarbonisation targets for the measures and indicators set.

Audience: This work is important for road agencies and companies in the road industry as it will identify the main decarbonisation issues when carrying out works. It will also enable an assessment of decarbonisation opportunities when using different types of construction equipment.

Deliverables: Literature review, case studies, survey, briefing note, workshop or conference, social media, guideline.

Background to TC's work on this topic: Carbon Neutrality of the Road Sector. A PIARC special project. 2023.

Low and lower-middle income countries: The work should allow the identification of best solutions and good practices in the selection of construction equipment. It should also identify the least carbon-intensive technologies for various technologies including earthworks.

Gender inclusion & diversity: The work has no direct gender and diversity implications. There will be an indirect impact on people when works are carried out in residential areas.

Potential duration: 2024–2027.

4.5.5 Carbon calculators

Purpose: The purpose of this topic is to carry out a study of digital tools to compare carbon analyses at different stages of the project lifecycle. The result will be a gap analysis and recommendations based on context. The aim is also to prepare assumptions for a digital tool to determine carbon emissions across the project lifecycle.

Preliminary research questions:

The work should answer questions on:

- What elements should be included in the emissions calculator (materials and their processing, equipment and machinery and their operation, logistics in construction and maintenance)?
- What project lifecycle digital carbon emission calculator tools are currently available?
- What role should carbon calculators play in business cases, performance requirements, contract management and third-party assurance?
- What metrics do available tools provide, and which metrics appear to be missing (gap analysis)?
- What are potential applications of AI for the calculator?
- What are the proposed performance specifications and what are the target groups for the PIARC calculator?
- What are the minimum technical and financial requirements (requirements assessment) to build a PIARC calculator?

Importance to roads agencies: This work is important for road agencies and the road industry as it will highlight the capabilities of existing carbon calculators. It will also enable PIARC to assess the feasibility of the calculator and provide assumptions for its implementation and use of AI.

Audience: The audience of the work will be both road agencies and road companies. PIARC will be the recipient of the studies on the development of its own calculator.

Deliverables: Literature review, technical report, case studies, article in Routes/Roads, briefing note, podcast, workshop or conference, social media, guideline. Depending on the development of artificial intelligence, it may be possible to create a simple system analysing carbon emissions in a different form than existing calculators based solely on computational algorithms. The manual will include the collected information from all TCs in the scope of ST4.

Background to TC's work on this topic: Carbon Neutrality of the Road Sector. A PIARC special project. 2023.

Low and lower-middle income countries: LMICs as well as countries which are not very advanced in decarbonisation will be given an overview of digital tools which can be used in the road sector. If the PIARC calculator is developed, they will be able to use it under certain conditions.

Gender inclusion & diversity: The outcome of the work (carbon calculator) will in future enable remote working from home for those caring for children and for people with special requirements such as partial or full immobility.

Potential duration: 2024–2027.