PIARC TECHNICAL COMMITTEE 4.3- CI-Route-DGIR-AGEPAR NATIONAL COMMITTEE

Second announcement

International Seminar on sustainable and resilient earthworks and unpaved roads in the face of CLIMATE CHANGE.

14, 15 and 16 April 2025 in Abidjan (Côte d'Ivoire)

I. BACKGROUND AND JUSTIFICATION

In the current context of climate disruption and change, natural phenomena are becoming more frequent and acute. According to the Agence Française de Développement (AFD: L'économie africaine 2023), in West Africa, the number of days with temperatures above 40.6°C could rise from around 60 days between 1985 and 2005 to between 105 and 196 days by the end of the century. Between 1960 and 2018, Morocco experienced a 20% reduction in rainfall, and the filling rate of its dams fell from just over 60% in 2013 to less than 30% in 2022.

Earthworks, which make up the bulk of unpaved roads, are hard hit by the effects of climate change (drought, flooding, etc.), which cause damage characterised by longitudinal cracks close to the edges, large transverse and longitudinal gullies, quagmires, road cuts, spalling, and shrink-swell phenomena of the constituent materials, particularly materials containing clay particles or very plastic clay soils.

The structure of unpaved roads in developing countries, particularly in Africa, is in most cases made up of lateritic alluvial materials consisting of a gravelly fraction embedded in a clay matrix. Infrastructure plays an important role in the economies of these countries. They often link agricultural production areas to inhabited rural areas. These roads are therefore a lever for socio-economic development.

It is well known that the quality and efficiency of road infrastructure affect people's quality of life, the health of the social system and stimulate economic growth. The lack of maintenance or the poor condition of roads inevitably leads to the deterioration of these factors.

In this context of climate change and the importance of the quality of infrastructure in rural areas for the socio-economic development of populations, it seems important and even a priority for specialists in the field of earthworks to seek solutions with a view to preserving them.

II. ISSUES AND OBJECTIVES

II.1 Challenges

Most West African countries have a road network that is predominantly earth. For example, Côte d'Ivoire's classified interurban road network is over 82,000 km long, of which 7,731 km are surfaced (AGEROUTE data, March 2024), i.e. less than 10%.

The problems with earthworks and unpaved roads are their vulnerability to weather conditions (temperature, rainfall, etc.) and to traffic, which causes environmental pollution through dust emissions, especially in the dry season. These platforms generally have a limited lifespan (5 years on average) in the absence of maintenance.

The challenges lie in preserving earthworks (maintenance) and mitigating the risk of damage caused by weather conditions. Effective management of route interruption (for example) will help to make this infrastructure more sustainable. Controlling these risks will also help to strengthen their resilience. Infrastructure resilience can be considered as the capacity to

absorb shocks caused by natural phenomena (PIARC TC4.3 Full Report, 2024; GRETE FAREMO, UN, 2015).
Ultimately, road infrastructure must be developed in such a way as to support essential services over the long term.

II.2 General objective

The aim of the seminar is to analyse the impact of increasing rainfall duration and intensity, and of drought periods on earthworks.

Drainage problems during rainy periods, with the associated challenges of their maintenance, but also desiccation and cracks appearing during dry periods, will be addressed. The aim is to analyse, among other things, design and maintenance methods, and to propose possible adaptation and/or mitigation solutions to limit the risk of damage (slope collapse, landslides, cracks, road cuts, ruined structures, etc.). These solutions should strengthen their resilience and extend their lifespan.

II.3 Specific objectives

More specifically, it involves :

- Analysis of the possibility of a soil classification for earthworks in Africa, more effective than the current CBR-based soil classification, in order to better distinguish the conditions of use of different soils according to regional variations, geology, relief and climate;
- Analysis of the sensitivity of earthworks to water in terms of weather and hydrogeological conditions, taking into account the nature of the subsoil;
- Analysis of the design in terms of geometry (longitudinal profile, cross-section, gradients, etc.);
- Analysis and identification of technological advances in earthmoving and compaction techniques and propose more effective techniques or methods that are better suited to unpaved roads;
- Examination of existing solutions and proposals of innovative solutions to combat atmospheric pollution (dust emissions) and ensure the sustainability of these earthworks;
- Analysis of existing financing methods and proposals for more effective financing strategies for the maintenance of unpaved roads not covered by the State budget;
- Proposals for more coherent and efficient strategies for managing, planning and scheduling road maintenance work;
- Analysis and evaluation of the use of labour-intensive maintenance methods (HIMO) applied to certain routes.

III. TARGET AUDIENCE

The seminar will involve :

- Road sector professionals (road administrations and public services, project managers, public works companies, engineering and consultancy firms, road laboratories, etc.) from all countries;
- Road transport experts ;

- The expert members of PIARC (World Road Association) ;
- The expert members of AGEPAR (Association of African Road Managers and Partners);
- Researchers from laboratories, universities and business schools;
- Climate experts and other weather phenomena ;
- Students and doctoral students;
- Road infrastructure financing experts (banks, technical and financial partners, financial institutions, etc.).

IV. ORGANISATION OF THE SEMINAR

IV.1 PIARC programme of international seminars

PIARC (World Road Association) is a non-political, not-for-profit organisation whose mission includes organising forums, disseminating best practice and promoting efficient tools for decision support in road matters. As part of its work and since 1999, the Association has been organising a programme of international seminars, which strengthens its presence in the world, its awareness of the needs of developing countries and countries in transition and makes the results of the Association's work more widely known in these countries.

This seminar will be organised jointly with:

- **The Côte d'Ivoire National Road Committee (CNCI-Route)**;
- **The Ministry of Public Works and Road Maintenance,** through its central departments and subordinate departments (Directorate-General for Road Infrastructure (DGIR), Directorate-General for Road Innovation and Quality (DGIRQ), Road Management Agency (AGEROUTE), Road Maintenance Fund (FER));
- **PIARC with the Technical Committee 4.3 Earthworks** ;
- **AGEPAR (Association of African Road Managers and Partners)**.

IV.2 Technical Committee 4.3 TERRASSEMENTS

Technical Committee 4.3 Earthworks is dedicated to earthworks and earth structures, in the design, construction, maintenance and upkeep phases.
The knowledge acquired in the course of this work is the subject of publications which are available on the PIARC website:
- an Earthworks Manual (still being drafted)
- a report on the resilience of earth structures (case studies and general report)
- a report on techniques and innovations for increasing the resilience of earth structures (case studies and general report)

The TC 4.3 technical committee is working for the 2024-2027 cycle on :
- the completion of the Earthworks Manual
- reducing greenhouse gas emissions in the earthworks sector
- the drafting of an Asset Management Manual for earth structures

IV.3 AGEPAR (Association of African Road Managers and Partners)

AGEPAR is a non-political organisation. It aims to :

- Develop exchanges between the various players involved in the road sector;
- Capitalise on and develop know-how by encouraging applied research, initial and vocational training, and the dissemination of information in the road sector;

- To promote the integration of African road networks, the harmonisation of standards for road construction, maintenance and operation, and the improvement of the sector's performance;
- Assist the relevant political authorities and financial development institutions by making recommendations;
- Strengthen local initiatives by organising conferences, seminars and workshops to further develop and enhance technical and professional skills.

The organisation of the seminar will involve other partners such as :
- The National Bureau for Technical Studies and Development (BNETD);
- The National Chamber of Civil Engineering Engineers and Experts (CHANIE) ;
- The Groupement Ivoirien du Bâtiment et des Travaux Publics (GIBTP).

The seminar will be sponsored by the Ivorian Minister for Road Infrastructure.

A Scientific Committee and an Organising Committee have been set up.

IV.4 Scientific Committee (SC)

It is responsible for collecting proposals for abstracts and final papers, and for drawing up the programme for the various technical sessions. The Scientific Committee is made up of people from :

- **Dr Paulin KOUASSI**, President of CNCI Route ;
- **Dr Arnaud ZAGBAI TAPE**, Head of Technical Committees CNCI Route
- **PIARC / Technical Committee 4.3**;
    - **Patrick Boisson (Chairman of the TC)**
    - **Enrico Mittiga**
    - **Jason Hastings**
    - **Alexandra Ferreira**
    - **Jinsong Qian**
    - **Lamis Makki**
- **Mamadou Samba DIALLO,** 1er Vice-Chairman of AGEPAR
- **OUATTARA BAMASSA**, Head of the Directorate-General for Road Infrastructure (DGIR);
- **Professor Athanase KONIN**, Director General of Road Innovation and Quality (DGIRQ);
- **Jean François CORTE**, Consultant,
- **Dr MENIN Messou,** Managing Director of the MENSO consultancy;
- **Joël KELA,** Director of AGEROUTE

Other resource persons from the following organisations may be invited to take part in the Scientific Committee:

- BNETD ;
- LBTP ;
- IRON ;
- AGEROUTE ;
- DGTT ;
- GIBTP ;
- CHANIE ;
- CAFE-CACAO COUNCIL ;

- CIDT ;
- ANARCADE COUNCIL.

IV.5 Organising Committee (OC)

The organising committee is responsible for mobilising participants and communicators, seeking funding, and the various departments involved in ensuring the seminar runs smoothly. The structures involved are highlighted below:

- **William KOMENAN**, Treasurer CNCI Route
- **Flore GUE KLOKOUE**, Head of LBTP Research Division
- **Anatole KOUZONDE**, Secretary General of AGEPAR ;
- **PIARC / Technical Committee 4.3**
    - **PIARC General Secretariat (Miguel Caso Florez & Kaouther Machta)**
    - **Patrick Boisson (Chairman of the TC)**
    - **Lamis Makki**
    - **Yasmina Boussafir**
    - **Felipe Collazos Arias**
- **Germain KOUAKOU YAO**, Director General of Road Infrastructures (DGIR);
- **Philippe EPONON**, Managing Director of LRA, Chairman of GIBTP;
- **Souleymane COULIBALY,** President of the National Chamber of Engineers and Experts (CHANIE);
- **Dr Olivier KOUDOU,** Lecturer and researcher at the Université Félix Houphouët-Boigny
- **CAFE-CACAO COUNCIL ;**
- **CIDT ;**
- **CASHEW NUT COUNCIL**.

V. SEMINAR PROCEEDINGS AND LANGUAGES

The seminar will take place over three days on **14, 15 and 16 April 2025**, in open plenary sessions focusing on the themes mentioned in the programme below, with debates and a round table. A site visit will be organised on the last day of the seminar.
The languages used in the seminar will be French and English, with simultaneous translation.

V.1 Date and venue of the seminar

The seminar will take place from 14 to 16 April 2025 in Abidjan, Republic of Côte d'Ivoire. In 2021, the District of Abidjan had a **population of 6,321,017**, including **5,616,633** in the city of Abidjan (INS (Institut National de la Statistique) data). Abidjan is the economic capital of Côte d'Ivoire, a West African country with a population of **29,389,150** in 2021 (INS data).
Abidjan is also a cosmopolitan city. It is home to people from Mali, Senegal, Burkina Faso, Niger, Nigeria, Ghana, Benin, Togo, Cameroon, the West Indies, Lebanon, Morocco, Tunisia and France. Most of them are from the West African region.

V.2 Climate

Abidjan lies on the edge of the Gulf of Guinea, close to the equator. This gives it a humid (83.5%) equatorial climate, with an average temperature of **27.8°C** and average rainfall of 1,580 mm, two dry seasons lasting a total of 3 to 5 months and two rainy seasons lasting a total of 7 to 9 months. **April is the start of the rainy season.** Rainfall peaks in June. The maximum annual rainfall for the city of Abidjan is 2,279 mm (SODEXAM data).

V.3 Programme

The following sessions are available:

- **Session 1:** Climate change: trends (and forecasts for the coming years) and assessment of climate units; consequences for the sustainability of road infrastructure ;
- **Session 2**: Soil classification: Road soils, the role of the CBR, French Guide for Earthworks (GTR), Piarc Earthworks Manual (part 2.A); Evolution of soil classification around the world: feedback;
- **Session 3:** Geometric design: Implementation of more efficient drainage and sewerage systems; Earthworks Manual (part 2.C)
- **Session 4:** Construction: What materials are used in earthworks? Mapping of deposits and conditions of use of materials in earthworks, How do countries use local materials? Compaction: feedback; Earthworks Manual (parts 2.D and 2.F)
- **Session 5:** Strategies for adapting to climate change: Measures for adapting unpaved road operations (responses to the challenges of climate variability and change: what specific protective measures for structures?), technical adaptations; Decarbonisation of works
- **Session 6:** Stabilisation of unpaved roadbeds: low-cost stabilisation technologies, innovations: feedback.
- **Session 7:** Sustainable management and financing of road maintenance: Sustainable management and innovative financing for sustainable and resilient roads; Asset management of earthworks;
- **Session 8**: Efficient maintenance strategies for unpaved roads: feedback (HIMO example).

The theme of the round table will be: **Improving the Resilience of Infrastructures to Climate Change: Challenges and Technical Responses**.

PRELIMINARY SEMINAR PROGRAMME

1st day Monday 14 April 2025		
Timetable		Speakers
8h00	**Recording**	
9h00	**Opening ceremony**	
	Welcome speeches	
	Speech by the Director General of the DGIR	Germain Kouakou YAO
	Speech by the Chairman of CNCI-Route	Dr Paulin KOUASSI, Chairman
	Speech by the Chairman of AGEPAR	The Malian Minister for the Environment, Sanitation and Sustainable Development Mamadou SAMAKE

	Interventions by PIARC	
	Presentation of the Technical Committee 4.3	Patrick BOISSON, Chairman
	Introducing PIARC	Chairman of PIARC
	Opening conference "Evolution de l'exécution des travaux d'entretien routier en Côte d'Ivoire de 1960 à nos jours : Retours d'expérience sur les routes non revêtues, les réussites et les échecs".	Dr MENIN Messou Managing Director of MENSO
	Opening address to the seminar	Minister for Infrastructure and Road Maintenance
	Visit the stands	
12h00	**Lunch break**	
14h00	**Session 1: Climate change and its impact on earthworks: Trends (and forecasts for the coming years) and assessment of climate units; consequences for the durability of road infrastructure**	
15h30	**Coffee break**	
16h00-17h30	**Session 2: Soil classification: road soils, the role of the CBR, the Guide des Terrassements Routiers (GTR), the Manuel des Terrassements (part 2.A); changes in soil classification around the world: experience feedback**	
	2nd day Tuesday 15 April 2025	
9H00	**Session 3: Geometric design: Implementation of more efficient drainage and sewerage systems; Earthworks Manual (part 2.C)**	
10h15	**Coffee break**	
10h45	**Session 4: Construction: What materials are used in earthworks? Mapping of deposits and conditions of use of materials in earthworks, How do countries use local materials? Compaction: feedback; Earthworks Manual (part 2.D and 2.F)**	
12h00	**Lunch break**	
14h00	**Session 5: Strategies for adapting to climate change: Adaptation measures for unpaved road operations (responses to the challenges of climate variability and change: what specific protection measures for structures?), technical adaptations; Decarbonisation of works.**	
15h30	**Coffee break**	
16h00	**Session 6: Platform stabilisation: low-cost stabilisation techniques and technologies, innovations: experience feedback**	
19h30	**Gala dinner**	
	3rd day Wednesday 16 April 2025	
9h00	**Session 7: Sustainable management and financing of road maintenance: Sustainable management and innovative**	

	financing for sustainable and resilient roads; Asset management of earthworks;	
	Session 8: Efficient maintenance strategies for unpaved roadbeds: feedback (HIMO example)	
10h30	**Coffee break**	
11h00	**Round table: Improving the resilience of infrastructure to climate change: issues and technical responses**	
11h45	**Closing of the seminar**	
12h00	**Lunch break**	
13h30	**Technical visit**	

V.4 Call for papers

Proposals for papers in the form of an abstract of no more than one page should be sent to the following e-mail addresses before **31 October 2024**.

Scientific part: **Dr Paulin KOUASSI, kouassipm@yahoo.fr, +2250707046251**
Dr Arnaud ZAGBAI TAPE, arnaudzagbai@yahoo.fr, +225 0768837738
Jean François CORTE, jf.Corte@wanadoo.fr
Dr Lamis MAKKI, lamis.makki@univ-eiffel.fr

V.5: Travel and transport

Abidjan's Félix Houphouët-Boigny International Airport is the gateway for all air travellers. It is equipped with safety and security facilities. Urban transport services (Taxis, Yango, Uber, etc.) connect you to the city. As far as travel is concerned, you will need to bring your travel documents and vaccination card. In the city, you can get around by online booking (Yango, Uber, etc.), by taxi or by public transport (bus). The currency used is the CFA franc. 1 euro = 655.957 FCFA.

Foreign visitors require a visa, obtained on presentation of a letter of invitation supplied by the organising committee, and an up-to-date vaccination record. The yellow fever vaccine is compulsory, and other vaccinations may be recommended.

V.6 Registration fees

	Date	**Country**	**Rates**	**Terms of payment**
Seminar	Before 28 February	Middle- and low-income countries	**65,000 FCFA or 100 euros**	By bank transfer to the CNCI-Route account (see box below)
		Developed countries	**200,000 FCFA or 300 euros**	
	After 28 February	Middle- and low-income countries	**FCFA 80,000 or 122 euros**	
		Developed countries	**262,000 FCFA or 400 euros**	
Gala dinner		Developed countries	**60 euros or FCFA 40,000**	
		Intermediate countries	**25,000 FCFA or 40 euros**	

Virement Bancaire

Code Banque	Code Guichet	N° de Compte	Clé RIB
CI059	01034	121210019001	37

COMITE NATIONAL COTE D'IVOIRE ROUTE
IBAN : CI93 CI05 9010 3412 1210 0190 0137
Code Swift: ECOCCIAB
Ecobank CI, Agence Cocody St Pierre Riviera 3 Route du Lycée. 01 BP4107 Abidjan 01/ 27 20 31 92 00

Please register via the Ivorian National Committee CNCI Route web page: https://cnciroute-ci.org
For more information, please contact the following people:
Dr Paulin KOUASSI, kouassipm@yahoo.fr
Dr Arnaud ZAGBAI TAPE, arnaudzagbai@yahoo.fr
William KOMENAN, wkomenan@yahoo.fr

V.7 Accommodation

The Organising Committee will provide participants with a list of hotels and prices for overnight stays.

V.8 Seminar leaders

For further information about the papers or the organisation of the seminar, please contact one of the people listed below.

If you have any questions about the organisation or registration, please contact the following people:
Organisation: **Ms Flore KLOKOUE, fgue@lbtp.org, +2250757795465**
Mr William KOMENAN, wkomenan@yahoo.fr +2250556562411

VI. EXPECTED RESULTS

The expected results are :

- Possible solutions for better identification of available earthworks materials to ensure sufficient load-bearing capacity for roads;
- Possible solutions for identifying and classifying soils according to their mechanical and geotechnical characteristics;
- The use of materials depends on the type of work to be carried out;
- Identifying suitable earthmoving and compaction techniques;
- Sharing feedback;
- Proposals for geometric design ;
- Identifying innovative ways of financing the maintenance of earthworks and platforms;
- Proposals for efficient management, coherent programming according to region and season, and work planning;
- Identifying road stabilisation materials and technologies to improve performance;
- Proposals for drainage and sanitation systems;

VII. BIBLIOGRAPHICAL REFERENCES

1- Agence Française de Développement : l'économie africaine 2023, Repères Economie, La Découverte ;
2- IGHIL AMEUR L.: Sécheresse: les routes sous surveillance. La Gazette des Communes, CEREMA, France 2023;
3- World Bank: Rural Roads in Sub-Saharan Africa, John, D.N. Riverson, Juan Gaviria, and Sydney Thriscutt, Issue 141F Africa Technical Department Series, 1992;
4- FAREMO G. Goal 9: Build resilient infrastructure, promote industrialisation, UN, June 2015;
5- PIARC, Resilient, sustainable and safe rural roads and earthworks, 3, 4 and 5 May 2023, Tunis, Tunisia, 2 .ème
6- PIARC, Résilience des ouvrages en terre face aux risques naturels, Full report forthcoming
7- Earthworks manual, Part 1 General, Part 2 Technical sections