TANZANIA ROAD SAFETY INITIATIVE

REPORT ON

Training Course on Road Infrastructure Maintenance and Management to Ensure Road Safety in Tanzania

at Four Point Hotel-Dar es Salaam, Tanzania
24th – 28th June, 2024

EXERCUTIVE SUMMARY

The Tanzania Road Safety Initiative (TARSI) organized a Training Course on Road Infrastructure Maintenance and Management to emphasize the crucial role of road maintenance in enhancing safety. The course, held over five days at New Africa-Four Points Hotel in Dar es Salaam starting from 24 to 28,June 2024, highlighted the need for a comprehensive approach to maintenance to reduce lifecycle costs and extend infrastructure lifespan. Unlike construction, maintenance requires ongoing commitment and effective management. Through expert discussions, institutional reforms, and capacity building, the training aimed to optimize maintenance practices and led to recommendations for improving road safety in Tanzania. Prior to the course, TARSI conducted meetings with stakeholders and a survey to assess road infrastructure conditions, revealing significant challenges exacerbated by environmental factors and traffic, especially in a low-income country like Tanzania.

The primary objective of the course was to demonstrate how proactive preservation strategies can minimize overall costs and disruptions, providing a sustainable approach to managing transportation networks. Participants were equipped with the knowledge and skills to understand the significance of road maintenance management, plan and prioritize tasks using multi-criteria decision-making, develop comprehensive road management plans, identify and recommend improvements to existing programs, and utilize modern tools for effective road maintenance. The training underscored the importance of continuous maintenance efforts and effective management in ensuring road safety and infrastructure longevity.

LIST OF ABBREVIATIONS.

DART-*Dar es Salaam Rapid Transit*
ERB-*Engineers Registration Board*
TARSI-*Tanzania Road Safety Initiative*
TANROADS-*The Tanzania National Roads Agency*
TARURA-*Tanzania Rural and Urban Roads Agency*
RFB-*Roads Fund Board*
LATRA-*The Land Transport Regulatory Authority of Tanzania*
NIT-*National Institute of Transport*
ZARTSA-*Zanzibar Road Transport and Safety Authority*
PO-RALG-*President's Office, Regional Administration and Local Government Tanzania*
UK-*United Kingdom*

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INTRODUCTION

The Training Course on Road Infrastructure Maintenance and Management, organized by the Tanzania Road Safety Initiative (TARSI) in collaboration with Ministry of works, PO-RALG,TANROADS and TARURA with the aim to educate participants on the critical role of road maintenance in enhancing road safety. The course underscored the importance of addressing maintenance comprehensively to reduce lifecycle costs and extend the lifespan of infrastructure. Unlike construction, maintenance requires an ongoing commitment and effective management.

The training covered various aspects such as management methods, institutional reforms, and capacity building to optimize maintenance practices. Expert and stakeholder discussions during the course led to recommendations for improving road safety in Tanzania.

To prepare for this training course, TARSI held several meetings with stakeholders, both in-person and virtually. A survey was conducted to gather information on the status of road infrastructure from engineers and road users. The survey revealed that roads deteriorate due to environmental factors and traffic, with heavy rains exacerbating damage and increasing accident risks. The challenge of maintaining road infrastructure is particularly significant in low-income countries like Tanzania, where substantial resources are required.

OBJECTIVES AND GOALS

The objective of the Training Course on Road Infrastructure Maintenance and Management to Ensure Road Safety in Tanzania was to highlight the importance of road infrastructure maintenance, demonstrating how proactive preservation strategies can minimize overall costs and disruptions, while providing a sustainable approach to managing transportation networks.

OVERALL OBJECTIVE.

To equip participants with the knowledge and skills necessary to understand the significance of road maintenance management, plan and prioritize maintenance tasks using multi-criteria decision-making, develop and evaluate comprehensive road management plans, identify and recommend improvements to existing programs, and utilize modern tools for effective road maintenance

SPECIFIC OBJECTIVES

1. Comprehend the importance of road maintenance management.
2. Plan and prioritize road maintenance employing multiple criteria decision-making.
3. Develop a comprehensive road management plan.
4. Identify and recommend improvements for existing maintenance programs.
5. Thoroughly evaluate complex road maintenance programs and plans.
6. Learn some modern tools for road maintenance

OPENING SESSION.

Mr. Barongo began by introducing the TARSI staff team, especially those who actively participated in the preparation of this training. He expressed his heartfelt gratitude for their dedication and efforts in making the training a success.

Mr. Barongo also expressed his gratitude to government departments such as TANROAD, TARURA, RFB, ERB,LATRA,DART,NIT, ZARTSA and the local councils for bringing in engineer participants for this training. He also thanked the government for the support it provides to TARSI, especially in ensuring that we have accident-free road usage. Additionally, he encouraged the training participants, who are engineers, to take full advantage of this opportunity and to share their knowledge during the sessions.

Mr. Maliki Barongo-TARSI Executive Director

WELCOME WORD BY MR. OCTAVIAN MSHIU, THE CHAIRMAN OF TARSI AND CHAIRMAN OF ORGANIZING COMMITTEE.

Mr. Octavian, Chairman of TARSI and the training organizing committee, welcomed everyone.

He acknowledged the successful preparation of the event, which was made possible by the collaboration of various government institutions including the President's Office, PO-RALG, the Ministry of Works, TARURA, TANROADS, RFB, ZARTA and LATRA.

Mr. Octavian also expressed gratitude to sponsors like CRDB Bank, the Road Fund Board, WASAFI Media, Dafra Online TV, and CH Designs for their financial and technical support, which helped meet international quality standards.

He highlighted that the course offered by TARSI aims to provide a thorough understanding of road maintenance, emphasizing its role in improving safety. The course focuses on differentiating maintenance from new construction, the need for continuous commitment, and optimizing processes through institutional reforms and capacity building. Participants will gain skills to implement effective maintenance practices, crucial for sustaining and enhancing Tanzania's road infrastructure.

Mr.Octavian Mshiu-TARSI Board Chairperson

THE OPENING SPEECH BY ENG. ROGATUS HUSEIN MATIVILA, THE DEPUTY PERMANENT SECRETARY (INFRASTRUCTURE) PO-RALG.

Eng. Rogatus began by thanking TARSI secretariat for appointing him to the opening of the training while representing Hon. Mohamed Mchengerwa (Minister for PO-RALG).

He described the participants attending the training, noting that many are engineers from various government departments. Present were representatives from TAMISEMI, the Ministry of Works, the Road Fund Board (RFB), TARURA, TANROADS, DART, the Zanzibar Road Transport and Safety Authority, consultants, contractors, and others registered for the training.

Eng. Rogatus highlighted that the main goal of this training is to support the participants by the end of this course on road infrastructure development and management.

Eng.Rogatus H. Mativila-The deputy permanent secretary PO-RALG

He addressed the training's focus on Road Infrastructure Maintenance and Management to Ensure Road Safety in Tanzania, highlighting the participation of representatives from various institutions such as TARURA, TANROADS, OR-TAMISEMI, DART, the Ministry of Labor, the Road Fund Board, TAA, and the Zanzibar Road and Transport Authority, as well as consultants, contractors, and others. He expressed hope that participants would engage and share experiences and best practices to tackle maintenance challenges.


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INTRODUCTION

Dr. E. Rwakarege (TZ) officially introduced the training course on Road Infrastructure Maintenance and Management to Ensure Road Safety in Tanzania. He emphasized that road infrastructure is a crucial asset contributing significantly to the economic growth of any country. However, like all assets, roads deteriorate over time and require proper maintenance, which demands substantial resources. This poses a challenge due to limited resources and competing demands. Therefore, an economic evaluation of various road investment strategies is essential to ensure the efficient use of these scarce resources.

With extensive road networks already in place, the focus has shifted to preserving existing infrastructure. This training aims to explore different management methods for road maintenance and gather recommendations to improve road maintenance and safety in Tanzania through comprehensive discussions with road experts and stakeholders from within and outside the country. Participants will gain a thorough understanding of road maintenance, emphasizing the importance of addressing maintenance issues promptly and adequately to ensure long-lasting and safer roads. The course is expected to reduce the lifecycle costs of the road network and infrastructure. Unlike constructing new roads, which have a clear start and end, road maintenance is a continuous process that requires ongoing commitment.

THE PURPOSE OF ROAD MAINTENANCE ACTIVITIES.

Dr. E. Rwakarege (TZ) continued the training on road maintenance, which encompasses all tasks necessary to preserve the riding quality, shape, drainage, culverts, structures, and bridges, as well as spot improvements to ensure accessibility. This includes resealing, reshaping, and regravelling. Over time, traffic loading and environmental factors cause every pavement to deteriorate, regardless of how well-designed and constructed it is.

He highlighted that the aim of maintenance is to slow down the deterioration process and is typically applied to functional failures. He also explained that rehabilitation aims to reset the deterioration process and is typically applied to structural failures.

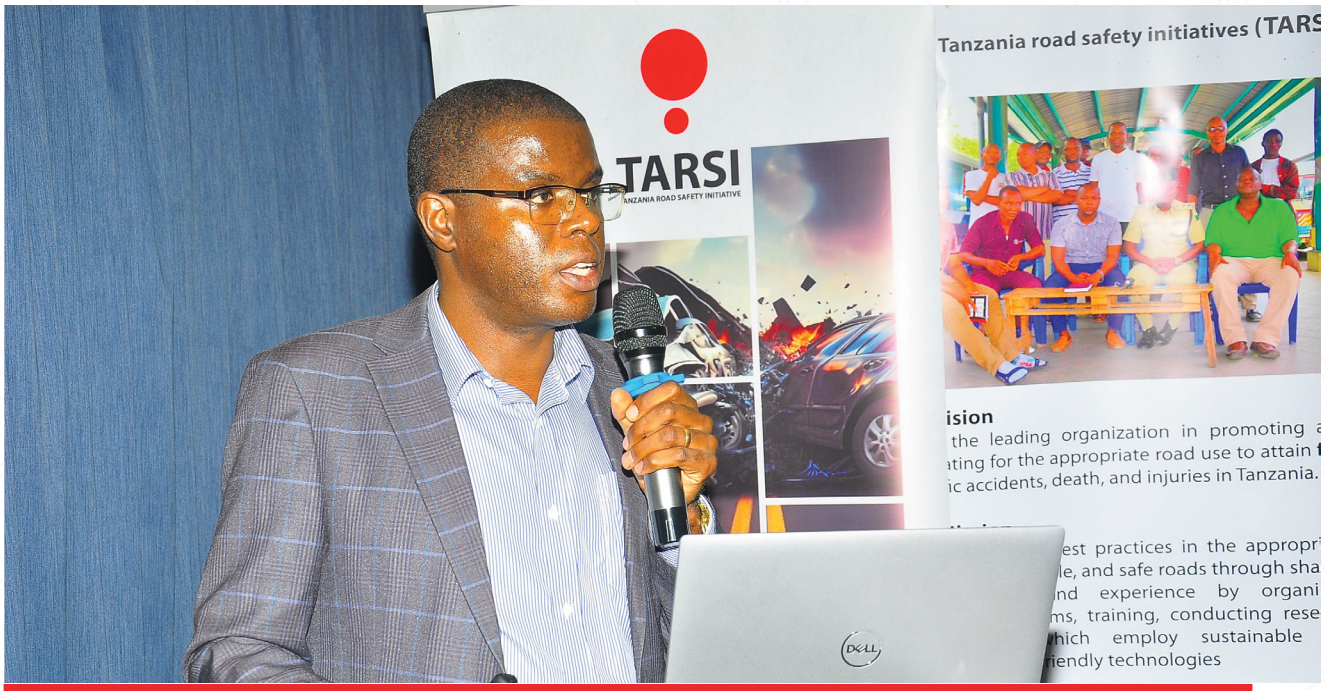
ASSET MANAGEMENT FRAMEWORK.

Eng. Dr. Mahmoud Elnasri's presentation from the UK detailed a comprehensive Asset Management Framework for road infrastructure aimed at optimizing the lifecycle of physical assets to ensure both safety and performance. The framework begins with the cataloging and classification of road assets, followed by regular condition assessments to pinpoint maintenance needs. It incorporates systematic maintenance planning, performance monitoring, and risk management strategies to address potential issues.

Efficient resource allocation and robust data management systems underpin these processes, while active stakeholder engagement ensures that the framework meets public needs. Adherence to relevant policies and standards is vital for compliance, and the framework emphasizes continuous improvement through regular reviews and updates to refine asset management practices.

MONITORING OF SURFACE CONDITION AND DATA ANALYSIS.

Dr. Rwakarere's presentation covered pavement condition surveys, emphasizing their importance in assessing roadways' structural integrity and surface quality for safe transportation. He discussed various survey methods, including visual inspections, automated systems, and advanced technologies like Ground Penetrating Radar (GPR) and Falling Weight Deflectometers (FWD). He also highlighted data collection techniques, such as manual recording, digital imaging, and Geographic Information Systems (GIS), stressing the need for accurate data to inform maintenance decisions. Dr. Rwakarere underscored the importance of integrating this data into comprehensive databases for effective long-term planning and resource allocation, illustrating the vital role of these processes in maintaining road safety and longevity.



Dr. Eradius Rwakarehe from the University of Dar es salaam UDSM)

DATA COLLECTION TECHNIQUES AND METHODS

The presentation was delivered by Dr. Mahamoud Elnasiri, who began by discussing the need for data collection. He emphasized that it is essential for every engineer collecting specific data to understand the importance and methods of data collection. He also touched on the different survey categories, identifying Inventory Survey and Structural Survey. The Structural Survey is divided into two subcategories: Non-invasive Techniques and others. Dr. Mahamoud explained that Invasive Techniques involve no traffic disruption, save time, and are safer for operatives. He concluded the topic by examining risk-based maintenance approaches.

UK APPROACH FOR SCHEME AND NETWORK LEVEL SURVEYS; STRATEGIC AND TECHNOLOGIES.

The visual presentation was conducted online by Dr. Ayad Subhy from UK. He explained that road pavements do not last forever and that maintenance is essential to keep the asset in a serviceable and safe condition. He also highlighted that once a section of road is identified as needing maintenance, a detailed investigation is required to determine the specific maintenance needs and to provide the necessary information for designing appropriate maintenance treatments. Dr. Subhy emphasized that network-level surveys, which are routinely conducted at traffic speed, are used to identify sections of pavement that may require maintenance. He stressed that the quality of data is crucial for modelling the rate of deterioration, which is key for designing robust maintenance cycles, prioritizing reliable schemes, and developing effective intervention strategies.

DATA QUALITY MANAGEMENT SYSTEMS

Kranthi Kuna's presentation emphasized the importance of Data Quality Management Systems (DQMS) in road infrastructure management and maintenance. These systems ensure that decision-making data is accurate, consistent, and reliable. Key components of a robust DQMS include data governance (policies and procedures), data integration (consolidating information from various sources), and data validation (ensuring accuracy and completeness). High-quality data is essential for monitoring road conditions, scheduling maintenance, and evaluating maintenance strategies.

DQMS also involves continuous data auditing and cleansing to maintain data integrity. Advanced tools like Geographic Information Systems (GIS) and sensor-based data collection enhance data precision. Maintaining high data quality allows road authorities to make informed decisions, improving maintenance efficiency, optimizing resources, and enhancing road safety. In Tanzania, a robust DQMS can significantly enhance the effectiveness of road maintenance programs, leading to a more reliable and safer road network.

MAINTENANCE OF BRIDGES, TUNNELS AND DRAINAGE STRUCTURES.

The presentation was delivered by CEng. Shine Salur from Australia. She began by explaining the concept of asset maintenance, describing it as a set of coordinated activities that an organization uses to realize value from an asset in the delivery of its outcomes or objectives. She then discussed various aspects of maintenance, including drainage maintenance, structures maintenance, major culverts maintenance, bridge maintenance, and tunnel maintenance.

MAINTENANCE OF ROAD SURFACES, SHOULDERS AND ROAD-SIDES.

Effective maintenance of road surfaces, shoulders, and roadsides is essential for safety, functionality, and longevity. Regular inspections and timely repairs of asphalt or concrete surfaces prevent deterioration and ensure smooth driving. Maintaining shoulders by grading, resurfacing, and clearing debris supports the road structure and proper drainage. Consistent attention to roadsides, including vegetation management, litter collection, and drainage maintenance, prevents visibility obstructions and safety hazards. A comprehensive maintenance strategy enhances road safety, extends infrastructure lifespan, and improves driving conditions. In Tanzania, prioritizing these activities is crucial for a reliable road network. The presentation was done by Dr. E. Rwakarehe.

IMPLEMENTATION OF TRAFFIC CONTROLS AND SAFETY DEVICES.

Implementing traffic controls and safety devices is vital for managing road safety and improving traffic flow. Traffic controls like signals, signs, and road markings guide vehicle and pedestrian movement, while well-placed signals ensure orderly intersection flow and clear signs provide crucial information. Safety devices such as barriers, guardrails, and speed bumps help prevent accidents and reduce collision severity. Advanced technologies, including automated traffic management systems and surveillance cameras, offer real-time data for better traffic control and quick responses. In Tanzania, effectively implementing and maintaining these measures is essential for reducing accidents, improving road user behaviour, and enhancing overall road safety. The presentation was done by Joe Sprowell.

MANAGE ADVERSE WEATHER CONDITION (SNOW, ICE, RAIN, FLOOD ETC)

Shine Salur led the presentation, beginning with a quick recap of the drainage and flood impact in the City of Marion/Adelaide, Australia. She then explained the reasons behind these issues, focusing on climate change and its connection to the broader carbon narrative. Salur discussed why the world is taking action now, what different countries are doing in response, and concluded with specific details on flood management actions in Somerset, UK.

Eng. Ally Ismail from Tanzania Rural and Urban Roads Agency (TARURA

OVERVIEW OF MAINTENANCE OPERATIONS AND MAINTENANCE OF RIGID PAVEMENT.

Maintenance operations for road infrastructure are vital for safety, durability, and functionality. For rigid pavements, typically made of concrete, essential practices include joint sealing, surface cleaning, and minor crack repairs. More extensive tasks involve slab replacement, diamond grinding, and dowel bar retrofitting. A comprehensive maintenance strategy with regular assessments and timely interventions extends pavement lifespan. Advanced technologies like ground-penetrating radar and pavement management systems enhance maintenance effectiveness. Prioritizing rigid pavement maintenance ensures a safer and more reliable road network in Tanzania, boosting overall road safety and efficiency.

PROCEDURES FOR PAVEMENT REHABILITATION AND RECYCLING

Value engineering enhances project value by analyzing functions to find cost-effective solutions without compromising quality. In road maintenance and construction, involving designers in this process improves efficiency and sustainability. Engineers and designers collaborate to explore alternative materials methods, and practices, considering lifecycle costs, durability, and environmental impact. This ensures projects remain cost-effective while meeting safety and performance standards, leading to innovations like recycled materials, modular construction, and advanced monitoring technologies. In Tanzania, adopting value engineering can improve infrastructure resilience, optimize resources, and enhance road safety, supporting sustainable development goals.

DEVELOPING AN EFFECTIVE ROAD MAINTENANCE STRATEGY & MAINTENANCE MANAGEMENT SYSTEM (INC CMMS DEMO) & PERFORMANCE METRICS

Developing an effective road maintenance strategy is essential for the longevity and safety of road infrastructure. This involves creating a comprehensive maintenance management system that integrates preventive and corrective practices. A Computerized Maintenance Management System (CMMS) is crucial, as it tracks maintenance activities, schedules inspections, and manages resources efficiently. Clear performance metrics, including road condition indices, maintenance response times, and cost efficiency, are vital for assessing maintenance effectiveness. Implementing such a system enables Tanzanian road authorities to ensure proactive, well-coordinated maintenance activities that align with safety standards, enhancing road safety and infrastructure reliability.

ASSET LIFECYCLE PREDICTION MODELLING AND CAPITAL PLANNING (FEATURING PREDICTIVE MODELLING DEMO)

Effective asset lifecycle prediction modeling and capital planning are crucial for comprehensive road infrastructure management. During the training, advanced techniques for forecasting the lifespan and performance of road assets were demonstrated. By using historical data and advanced analytics, accurate predictions regarding maintenance needs, potential failures, and optimal replacement times can be made. These predictive insights significantly benefit capital planning, aiding in informed decision-making for budget allocation and investment priorities. By anticipating future maintenance requirements and asset deterioration, road authorities can strategically plan capital expenditures to extend asset lifespans and enhance road safety. This proactive approach improves resource utilization, minimizes unexpected costs and disruptions, and ensures a more sustainable and reliable road network for Tanzania.

HEALTH AND SAFETY FROM DESIGN TO CONSTRUCTION

Ensuring health and safety from design to construction is critical in road infrastructure projects. This includes incorporating safety features like proper road geometry, signage, and pedestrian pathways in the design phase. During construction, strict safety protocols such as PPE usage, traffic management plans, and regular safety training are essential. Continuous monitoring and adherence to safety standards prevent accidents and ensure a secure work environment. By prioritizing health and safety at every stage, Tanzanian road projects can achieve regulatory compliance and create safer roadways for all users.

MAINTENANCE OF GRAVE ROADS

Maintaining gravel roads is crucial for safe and reliable transportation, especially in rural Tanzania. Effective maintenance includes regular grading, filling potholes, and ensuring proper drainage to prevent erosion and water damage. Using quality gravel with the right mix of particle sizes is essential for road integrity and performance. Routine inspections help address issues promptly, minimizing disruptions and extending the road's lifespan. A systematic maintenance schedule and community involvement can enhance these efforts. Prioritizing gravel road upkeep improves access and connectivity for rural communities, supports economic development, and enhances overall road safety in Tanzania.

To ensure the longevity and safety of road infrastructure in Tanzania, it is crucial to address quality issues in road maintenance, such as insufficient funding, lack of skilled personnel, and inadequate planning. Establishing a robust maintenance management system that includes regular inspections, timely interventions, and high-quality materials, along with staff training and performance metrics, can enhance maintenance effectiveness. Engaging stakeholders, including local communities and private sector partners, will provide additional resources and support, leading to safer and more durable road networks.

LEARN ABOUT PROMPTLY ADDRESSING ROAD EMERGENCY

Dr. Daru's presentation provided an in-depth analysis of asset maintenance, focusing on the importance of emergency repairs for road safety and infrastructure longevity. He outlined the necessary steps to ensure effective and safe remedial actions and discussed various emergency repair options, highlighting their specific applications and benefits. Dr. Daru also introduced advanced technologies that enhance repair efficiency and effectiveness. His discussion included a cost analysis of unplanned maintenance, underscoring the financial impact and the need for proactive maintenance strategies. He concluded by emphasizing the importance of high-quality emergency repairs to extend infrastructure lifespan and minimize future costs.

Participants during the group discussions session

ROAD AI APPLICATION ON SEALED ROAD NETWORK & CONCEPT FOR UNSEALED ROAD NETWORK.

Shine commenced her presentation by exploring advancements in AI technology, focusing on prominent tools such as ChatGPT, Copilot, and LinkedIn. She further elaborated on the application of AI in road management by introducing Road Metrics – an innovative AI system designed for roadway inspections, accessible via Road Metrics Platform. To illustrate its capabilities, she provided examples of sample networks where the system is implemented, including Peterborough City, Torbay, and Oxfordshire County in the UK, as well as Melbourne and Sydney in Australia. In her discussion, Shine also highlighted notable Road AI companies and their contributions to the field, mentioning technologies from Road metrics and Vaisala. These insights underscore the transformative impact of AI on road infrastructure management and its potential to enhance roadway safety and efficiency.

CLOSING CEREMONIES.

GENERAL INTRODUCTION

Mr. Maliki Barongo began by expressing his gratitude to the training participants, who are engineers, and extended his thanks to the Chairperson of the TARSI Board and the Guest of Honor for their roles in the closing ceremony of the training. He provided an explanation on why the training was organized by TARSI in collaboration with government departments such as TANROADS and TARURA. He highlighted that these departments played a crucial role in ensuring the success of the training by providing high-level cooperation and facilitating the participation of engineers. The training is officially recognized by the engineering registration authorities in Tanzania. Additionally, he expressed his appreciation to both local and international instructors who contributed to the training sessions.

WORD OF THANKS AND REMARK TO WELCOME GUEST OF HONOR.

Mr. Octavian Mshiu began by expressing his heartfelt gratitude for the acceptance of the invitation to officiate the Training Course on Road Infrastructure Maintenance and Management to Ensure Road Safety in Tanzania. Despite your demanding schedules and commitments both locally and internationally, you have made time to join us at the Four Points by Sheraton Dar es Salaam New Africa Hotel for this significant event. We are deeply thankful for your presence.

He then highlighted the involvement of key public and private institutions, which are essential stakeholders in the road and transport sector in Tanzania. These organizations, responsible for ensuring road safety and contributing to the development and management of road networks in their respective regions, were invited to participate in this specialized training course. The delegates present include representatives from PO-RALG (TAMISEMI), the Ministry of Works, the Road Fund Board (RFB), TARURA, TANROADS, DART, TAA, DIT, the Zanzibar Road Transport and Safety Authority, as well as consultants, contractors, and other notable entities.

OFFICIAL CLOSING

Eng Bernald Kavishe, the Registrar of Engineers representing Minister of Works Hon. Innocent Bashungwa, began by thanking the Tanzania Road Safety Initiative (TARSI) and all collaborating organizations for organizing this crucial course. He highlighted the importance of discussing successful international case studies and applying these insights to improve road maintenance in Tanzania to reduce accidents.

He emphasized that road transport quality impacts employment and industrial development and noted that road infrastructure is a significant public asset valued at 39.5 trillion shillings, representing 23% of the National GDP. He expressed hope that participants will exchange experiences and best practices to lower maintenance costs and accident fatalities. As the Guest of Honor, he looks forward to receiving recommendations for enhancing road safety and infrastructure in Tanzania.

Eng. Kakwi Ngaleson from TANROADS receiving a participatory certificate from Eng. Bernald Kavishe at closing ceremonies

THE MAIN ACHIEVEMENTS OF THIS TRAINING ON ROAD MAINTENANCE AND INFRASTRUCTURE MANAGEMENT COURSE.

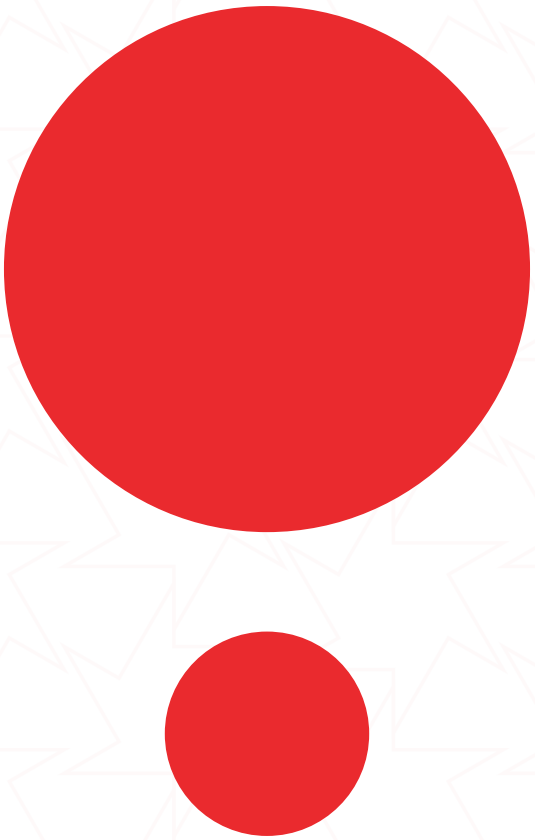
1. The participants gained in-depth knowledge about the lifecycle cost of the road network
2. The participants were able to understand maintenance management planning and execution.
3. Participants acquired additional skills in the development of robust maintenance strategies
4. The participants gained expertise in maintenance prioritization through their involvement in this training.
5. The participants learned about managing budgeting and financial aspects related to road maintenance.
6. They gained knowledge about implementing modern tools and technologies for road inventory management.
7. They learned about promoting maintenance sustainability.

RECOMMENDATIONS.

1. The participants of the training recommended that there should be a continuation of such training, as it is beneficial and enhances the efficiency of engineers currently in the field.
2. It was recommended that there should be a mechanism for funding to facilitate such training. Stakeholders such as PO-RALG, the Ministry of Works, TANROADS, and TARURA should be more involved in the planning of these training sessions.

OUR PARTNERS

TARSI would like to express our heartfelt gratitude to the partners who agreed to collaborate with us in organizing and successfully conducting this training. We believe that without their cooperation, we would not have been able to achieve this. We sincerely appreciate your participation and efforts in ensuring our roads are safe



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