



International Road Federation  
Fédération Routière Internationale  
Federación Internacional de Carreteras

## Regional Seminar and Course on Road Asset Management for Senior Executives and Decision Makers

*Held at*

Arusha International Conference Centre (AICC), Arusha, Tanzania,  
7<sup>th</sup> - 12<sup>th</sup> June 2021

# Post Training Report

*Prepared by:*

Prof. Donath Mrawira, PhD., P.Eng.  
4M Global Inc.

*Organised by:*

Tanzania Roads Association (TARA) in collaboration with the Tanzania Transportation Technology Transfer (TanT<sup>2</sup>) Centre, TANROADS and the Roads Fund Board under the Ministry of Works and Transport in Tanzania, Tanzania Rural and Urban Roads Agency (TARURA), and the International Road Federation (IRF) Geneva.

*Supported by:*



Date: 06/09/2021

# Post-Training Report

## **Regional Seminar and Course on Road Asset Management for Senior Executives and Decision Makers**

for

Tanzania Roads Association (TARA)

Arusha International Conference Centre (AICC), Tanzania

© *Prof. Donath Mrawira, August 14, 2021*

## Table of Contents

|  |    |
|--|----|
| EXECUTIVE SUMMARY .....  | 1  |
| Key Conclusions from the Training Course .....   | 3  |
| Key Recommendations .....  | 4  |
| 1.0 INTRODUCTION.....  | 7  |
| 1.1 An Overview .....  | 7  |
| 1.2 General Objective of the Course.....   | 7  |
| 1.3 Specific Objectives of the Course.....   | 8  |
| 1.4 Course Modules.....  | 8  |
| 2.0 Participants and Attendance.....   | 10 |
| 3.0 PRE-COURSE SURVEY RESULTS.....   | 10 |
| 3.1 Overall Evaluation Goal.....   | 10 |
| 3.2 Pre-Course Quantitative Results .....  | 10 |
| 3.3 Pre-Course Identified Barriers and Areas for Improvement.....  | 13 |
| 4.0 POST-COURSE SURVEY FINDINGS.....   | 17 |
| 4.1 Goal of the Post-Course Evaluation .....   | 17 |
| 4.2 Module by Module Course Assessment .....   | 18 |
| 4.3 Part II Post-Course Evaluation: Overall Impression .....   | 19 |
| 4.3.1 <i>Comments on Individual Modules</i> .....  | 19 |
| 4.3.2 <i>Participants' Comments on the Overall Impression of the Course</i> .....  | 19 |
| 5.0 FINDINGS FROM DECISION-MAKERS' ROUND TABLE DISCUSSIONS .....   | 22 |
| 5.1 Welcome & Opening Session .....  | 22 |
| 5.2 Highlights from the Opening Remarks .....  | 25 |
| 5.3 Key Findings from Round Table Topic #1 .....   | 25 |
| 5.4 Key Findings from Round Table Topic #2 .....   | 26 |
| 6.0 CONCLUSIONS AND RECOMMENDATIONS.....   | 26 |
| 6.1 Conclusions .....  | 26 |
| 6.2 Recommendations.....   | 33 |
| ACKNOWLEDGEMENT .....  | 35 |
| REFERENCE .....  | 35 |
| APPENDICES.....  | 36 |
| APPENDIX A: Course and Seminar Attendance Register.....  | 37 |
| APPENDIX B: Participants Comments on 4th Day of RAMS Training Course .....   | 38 |
| APPENDIX C: PART I of the Post-Course Questionnaire – Comments of the<br>Participants on each Module .....                             | 42 |
| APPENDIX D: PART II of the Post-Course Questionnaire. Participants Comments on<br>the Overall Impression of the Seminar & Course ..... | 46 |
| APPENDIX E. ROUND TABLE DISCUSSIONS – Decision-Makers' Seminar Held on<br>Saturday 12 <sup>th</sup> June 2021.....                     | 57 |

## ACRONYMS AND ABBREVIATIONS

|                   |  |
|-------------------|--|
| AADT              | Annual Average Daily Traffic   |
| AICC              | Arusha International Conference Centre   |
| AM                | Asset Management   |
| ANE               | Administração Nacional de Estradas [National Roads Administration (of Mozambique)] |
| APAs; PA          | Annual Performance Agreements; Performance Agreement                               |
| ARMFA             | African Road Maintenance Funds Association   |
| CEO               | Chief Executive Officer  |
| DROMAS            | District Roads Management System   |
| EDMS              | Records & Document Management System   |
| GIS               | Geographical Information System  |
| GPS               | Global Positioning System  |
| HDM-4             | Highway Development and Management Model, ver. 4                                   |
| IA                | Implementing Agencies  |
| IM <sup>3</sup>   | Infrastructure Management Maturity Model   |
| ISO               | International Organization for Standardization                                     |
| IT                | Information Technology   |
| KENHA             | Kenya National Roads Authority   |
| KeRRA             | Kenya Rural Roads Authority  |
| KRB               | Kenya Road Board   |
| KURA              | Kenya Urban Roads Authority  |
| LTIP              | Long-term Investment Planning  |
| M&E               | Monitoring and Evaluation  |
| MoWT              | Ministry of Works and Transport  |
| NRA               | Namibia Road Authority   |
| OPRC              | Output & Performance-based Road Contracts  |
| PORALG            | President's Office Regional Administration and Local Governments                   |
| RA                | Road Authority   |
| RAM               | Road Asset Management  |
| RAMS              | Road Asset Management System   |
| RFA               | Road Fund Administration (of Namibia)  |
| RFB               | Road Fund Board  |
| RMFA              | Road Maintenance Fund Administration (of Sierra Leone)                             |
| TANROADS          | Tanzania National Roads Agency   |
| TanT <sup>2</sup> | Tanzania Transportation Technology Transfer Centre                                 |
| TARA              | Tanzania Roads Association   |
| TARURA            | Tanzania Rural and Urban Roads Agency  |

## EXECUTIVE SUMMARY

This report presents a post-training report following the successful completion of the “*Regional Seminar and Course on Road Asset Management for Senior Executives and Decision Makers*” conducted for TARA at the Arusha International Conference Centre (AICC), Tanzania on 7<sup>th</sup> – 12<sup>th</sup> June 2021.

The course had the primary goal to introduce and develop practical understanding and application of road asset management system. The course focused on highlighting the critical impact of the resource allocation process, especially the use of advanced optimization and trade-off analysis in long-term and strategic planning on the sustainability of the road network conditions and effectiveness of the road agency. The course also consisted of a demonstration and presentations of case study of the Namibia Roads Authority and presentations on the status of current practice of Road Asset Management System (RAMS) in TANROADS, TARURA and the RFB. The course emphasized on the advantages of using full optimization across all asset types of the road authority to support senior management in making optimal decisions that will ensure the best road conditions and the most cost-effective use of available funds. The impact of each investment decision (on maintenance or new projects) can be evaluated and readily communicated to all stakeholders using colour-coded geographical maps (GIS). The course also introduced the ISO-55000 as the new international standard defining the requirements of comprehensive of asset management. Among other things, the ISO Standard requires agencies to manage all asset types, including intangible assets such as HR, IT and corporate good will. It also requires agencies to manage risks by adopting business process automation, etc. The course also introduced the key concept of planning at the strategic level across multiple types of assets (road pavements, bridges, culverts, and other road furniture). The course collected feedback from the participants through in-class quizzes and post-course questionnaire survey. This feedback will be useful to identify potential areas for further enhancement.

The course was very successful in meeting the intended objectives. Based on the feedback from the course participants, the overall assessment is that the goal and objectives of course were achieved at the highest level.

Information was gathered from pre-course questionnaire administered on the first day of course and post-course questionnaire to quantify the level of success of the course and draw key recommendations.

## Key Conclusions from the Training Course

These conclusions are drawn mainly from the seminar and course participants through their comments in pre-course survey, post-course survey and the round table discussions held on the sixth day.

The pre-course questionnaire survey showed that main barriers or challenges that are limiting or slowing the maturity of road asset management system in the region include: (i) Financial Constraints / Constrained maintenance budget / Insufficient / Shortage of fund. (Raised by 32 respondents out of 53); (ii) Lack of skilled manpower/expertise; Lack of technical capacity, Lack of training and adequate awareness in RAMS; lack of knowledge on asset management at all levels. (Raised by 24 respondents out of 53); and (iii) low awareness level of stakeholders; Buy-in by policy makers; Lack of decision makers support to give the importance that is needed for the Asset Management Issue; Political interference; Maintenance of existing roads is not taken very serious compared to the new construction (Raised by 21 respondents out of 53). Another key barrier mentioned is lack of accurate data collection; high data Collection cost; Lack of equipment / facilities such as condition surveys and traffic data and software; Lack of reliable analysis tools.

On the positive side, the pre-course survey showed that participants believe that road asset management system (RAMS) plays an important role in improving their work or the effectiveness of their agencies. The relatively high score of **9.13** [out of max. 10] suggests that the course participants will be open and supportive to any future steps to improve or implement a comprehensive road asset management system.

In the pre-course questionnaire survey, the participants identified areas of road asset management that their agencies will need to improve including: (a) Improve the planning to adopt RAMS approach, prioritization and allocation of resources for maintenance, enhancing capacity of staff on RAMS concepts. (b) Training (education to all stakeholder external and internal); Training of staffs; Training manual; (c) There is a need of introduction of RAMS in our (educational & research) institutions. Develop RAM curriculum. (d) Adopt trade-off analysis over all asset types; (e) Pursue the government to set aside funds ("Marshall Plan") for developing a huge network of district roads that is in poor conditions; (f) Setting aside satisfactory funds for maintenance; (g) Proper use of the system in decision making instead of human intervention in planning; and (h) Develop internal capacity within our agencies to develop (implement) and manage (operate) RAMS.

It was interesting to observe that the participants revised their assessment of the level of maturity of the practice of asset management in their agencies on the IM<sup>3</sup> scale of 1 – 6. The new regional average score on the RAM maturity is **3.18** (compared to the pre-course average score of **4.04**). This revised level of maturity suggests that, on average most road sector agencies in the region have staff with knowledge and experience, and have established inventory of road assets, and are using lifecycle analysis to prioritize maintenance and capital works for roads at the strategic level and operational levels.

## **Key Recommendations**

The report concludes by making following important recommendations, mostly drawn from the Course Participants through the pre- and post-course questionnaire surveys, and the one-day round table seminar discussions:

- (1.) It was recommended that road agencies, road fund boards and governments should take steps to address the identified barriers or challenges limiting the maturity of asset management including: constrained maintenance budget; lack of knowledge on asset management at all levels, i.e., low level of awareness among stakeholders and hence lack of support by policy makers and decision-makers on the importance of the Asset Management; political interference (preferring new roads rather than maintenance; and Lack of reliable analysis tools.
- (2.) It was recommended that similar courses should be organized road sector decision-makers to bring awareness on the importance of Road Asset Management (RAM). Tailored training on RAMS should target infrastructure development agencies and ministries. More road sector stakeholders should be encouraged to attend the RAMS course.
- (3.) An awareness seminar on Road Asset Management System should also be organized targeting high level government officials at the policy level, e.g., road sector ministers, members of the Parliamentary Committees for Infrastructure Development and Budget, etc.
- (4.) The need to broaden exposure and technical skills in the key concepts of Road Asset Management System was emphasized. It was recommended that similar training courses and seminar should be continued to ensure as many technical personnel.
- (5.) Given the importance of Road Asset Management to national economies, it was recommended that the Ministries of Education should include a course of road asset management in the college/university level and other sector research institutions.
- (6.) The current level of maturity of asset management in region was estimated at an average of **3.1** on the IM<sup>3</sup> scale [with highest level being 6]. There should be a

sustained capacity building on asset management in road agencies to ensure sustained growth to higher maturity levels.

- (7.) Road Fund Board (RFB) should consider using its Annual Performance Agreements (APA) with Implementing Agencies (IA) to ensure implementation and sustained maturity of Road Asset Management System in the roads agencies. Best Practices such as cross-asset allocation of resources based long-term (20+ years) impacts should be emphasized and monitored by the Road Fund Board.
- (8.) Awareness campaigns should be sustained at all levels including targeting the media and the public on socio-economic merits of prioritizing the preservation of existing assets before acquiring new ones (i.e., importance of maintenance over capital budgets).
- (9.) With regards to agencies intending to implement or enhance their road asset management system, it is worth considering the identified priority areas of RAMS including: (i) consider the emerging new elements of RAMS, especially, the implications of ISO 55000 Standard – which represents a more comprehensive definition & requirements of RAMS; (ii) improve the planning approach by using prioritization by trade-off analysis (for maximize value for money) over all asset types and allocation of resources for maintenance; and (iii) Proper use of the system approach in decision making & in planning instead of arbitrary human judgement.
- (10.) Other national level recommendations include: (i) develop curriculum and introduce the teaching of Road Asset Management (RAM) in our educational & research institutions; (ii) Engage the government to set aside funds (“Marshall Plan”) for addressing poor conditions of a huge network of district roads; (iii) Governments need to raise satisfactory funds for maintenance to mitigate rapid loss of road assets and the high negative impact on the economy.
- (11.) Regarding future offerings of the RAMS course, some areas can be improved including the following: (i) there is a need to increase the time to elaborate in details some important aspects in RAM; (ii) Some of the more technical modules, such as *Asset location referencing, GIS and GPS*; and *linear programming* – were considered of limited value to senior decision-makers. It is worth considering removing or simplifying/ shortening them; (iii) Breakaway sessions, group work/sessions, etc. should be considered to enhance learning and sharing experience; (iv) There is a need to increase the number of presenters/facilitators to broaden the experience sharing; (v) Include multi-lingual translators who will smoothen communication during the course and seminar. Proposed languages are Kiswahili, English, French and Portuguese; (vi) Site visits and tours are important to incorporated in future course invitations.



- (12.) Regarding the first topic of round table discussions, “*What are the pros and cons of implementing ONE Road Asset Management System? What is the preferred option?*” diverging comments were raised. The Kenya Road Board (KRB) preferred to have one strong RAM system for all road agencies and counties, since this is more cost-effective for the country. The road agencies from Tanzania preferred independent RAMS for each road agency with an interface for the Road Fund Board. Another noteworthy comment was that the preferred first option is to have one Road Management System (RAMS) for the country but the different road agencies to have acceptable interfaces to the one national system. The recommendation emerging from the round table would require more dialogue within each country and policy decision at the national level.
- (13.) Regarding the second round table discussion topic to find possible solutions and recommendations on the increasing gap in road maintenance funding, the following recommendations were made: (i) It was noted that using Roads Fund money for rehabilitation is basically double-charging road users instead of all tax payers. This will have a negative effect of increasing maintenance burden to the nation – since compromise on maintenance will result in increased backlog and need for rehabs and reconstruction down the road. (ii) Given the funding gap the focus should on (a) keep the good roads good (i.e., preservation first); (b) minimize transport costs by ensuring smooth roads. (iii) The governments develop “Marshall Plans” to revive the failed roads; and (iv) Need to look for alternative sources for road maintenance funds due to change of vehicle technology.

## 1.0 INTRODUCTION

### 1.1 An Overview

The Tanzania Roads Association (TARA) in collaboration with the Tanzania Transportation Technology Transfer (TanT<sup>2</sup>) Centre, TANROADS, TARURA, the Ministry of Works, Transport and Communication in Tanzania, the International Road Federation (IRF) Geneva, the World Road Association (PIARC) and other local and international institutions organized a 5 days ***Course on Road Asset Management for Senior Executives*** followed by a one day ***Regional Seminar on Road Asset Management for Decision Makers*** held at AICC, Arusha, Tanzania from 7<sup>th</sup> – 11<sup>th</sup> June 2021. Delegates for the Course were also invited to attend the Regional Seminar for Decision Makers.

To ensure quality design and delivery of the Regional Seminar and Course on Road Asset Management for Senior Executives and Decision Makers, the Tanzania Roads Association (TARA) retained the services of Prof. Donath Mrawira to be the Lead Facilitator. The regional seminar and course were successfully held on 7<sup>th</sup> – 11<sup>th</sup> June 2021 at the Arusha International Conference Centre. This report presents a post-course evaluation report following the successful completion of the course.

### 1.2 General Objective of the Course

The primary objective of the regional seminar was to share experience and best practices on Road Asset Management. For this purpose, current statuses and practice of asset management were presented from the Namibia Roads Authority, TANROADS, TARURA and the RFB.

The course among other things, introduced the concepts of strategic management for road networks and optimization of capital and maintenance works. The training course also dealt with optimization and trade-off analyses to answer questions such as where to spend the available funds to ensure maximum best condition of roads (i.e., best value for money). The course explored justified techniques for developing agency-wide (network-wide) strategic plans and setting achievable performance measures and targets to allow effective monitoring of progress, etc. The course also dealt with the trade-off between preservation of existing road infrastructure versus needs to build new ones, i.e., how should the road agencies objectively decide between maintenance vs. capital works. Also, extensive coverage was being given to the best practices from other agencies on the value of proactive preservation strategies. Unlike the previous offering of the course, this time around the course introduced the ISO-55000 as the new international standard defining the requirements of comprehensive of asset management. Among other things, the ISO Standard requires agencies to manage all asset types, including intangible assets such as HR, IT and corporate good will. It also requires agencies to manage risks by adopting business process automation, etc.

### 1.3 Specific Objectives of the Course

The specific objectives of the senior executives' course were to introduce and develop the participants understanding of the following concepts:

- Understand the fundamentals of road asset management system;
- Appreciate why using road asset management system is important to agencies;
- Visualize how the framework and principles of road asset management system fit into their agencies' core mandate;
- Use a standard RAMS maturity model to benchmark an agency' maturity of asset-management practice in their agencies;
- Develop a basic understanding of related technical concepts such as long-term planning, prioritization and optimization in resource allocation and performance measurements and setting KPIs;
- Appreciate the key elements and requirements of the International Standards Organisation, ISO-55000 as the new comprehensive definition of asset management. The course outlined the key emerging implications of ISO-55000 in implementing Asset Management.
- Acquire basic appreciation of strategic planning, budgeting; trade-off between preservation vs. capital expansion;
- Learn best practices of maintenance and preservation strategies for roads;
- Understand the role of and key elements of Performance measurement and monitoring progress in road agencies;
- Develop some awareness on the role of location referencing systems (managing a comprehensive inventory of assets), data and databases and related issues in road asset management;
- Acquire basic understanding of key enabling or supporting technologies that enhance road asset management, including mathematical optimization, Geographic Information Systems (GIS), Global Position System (GPS), etc.; and
- Appreciate the basics issues of developing an implementation plan.

### 1.4 Course Modules

The Regional Seminar and Course on Road Asset Management for Senior Executives and Decision Makers was presented in 15 modules over five-days as shown in Table 1. Approximately three modules were covered every day, with a typical day running from 8:30 am to 5:30 pm, with two refreshment breaks and a lunch break.

**TABLE 1. Description of Course Modules**

| <b><u>SEMINAR SESSION / COURSE MODULE</u></b>  | <b><u>FACILITATOR</u></b>      |
|--|--------------------------------|
| (1.1) Welcome, Introductions & Seminar and Course Expectations.                      | Prof. Donath Mrawira           |
| (1.2) Case Study – An Overview of Asset Management Practice in TANROADS              | Eng. Ephatar Mlavi             |
| (1.3) Case Study – An Overview of Asset Management Practice in TARURA.               | Eng. Deodati Donati            |
| (1.4) Current initiatives related to Asset Management System by RFB.                 | Eng. Rashid Kalimbaga          |
| (1.5) Summary of Current Practice of Asset Management in Tanzania.                   | Prof. Donath Mrawira           |
| (2) Framework & Principles of Road Asset Management.                                 | Prof. Donath Mrawira           |
| (1.8) Case Study of Road Management System – NRA                                     | Eng. Sophie Tekie (Zoom)       |
| (1.9) Live Demonstration of NRA’s Road Management System                             | Eng. Fergusson Paulse – (Zoom) |
| (5) Best Practices in Asset Preservation (Part I & II)                               | Prof. Donath Mrawira           |
| (6) Key Considerations in Implementing an Asset Management System                    | Prof. Donath Mrawira           |
| (7) Long-term Investment Planning, Prioritization & Budgeting (Part I & II)          | Prof. Donath Mrawira           |
| (8) Trade-off Analysis and Optimization.   | Prof. Donath Mrawira           |
| (9) Introduction to Linear Programming and Strategic Level Cross- Asset Optimization | Prof. Donath Mrawira           |
| (10) Performance Measurement & Monitoring.   | Prof. Donath Mrawira           |
| (11) Asset Location referencing; Role of GIS and GPS; and Data & Database Issues.    | Eng. Ephatar Mlavi             |
| (12) Hands on Example – Understanding Optimisation & Priority Planning               | Prof. Donath Mrawira           |
| (13) Course Summary and Conclusions  | Prof. Donath Mrawira           |
| (14) Post-Course Evaluation  | Prof. Donath Mrawira           |
| (15) Closing Ceremony & Presentation of Certificates                                 | Guest of Honour                |

## 2.0 PARTICIPANTS AND ATTENDANCE

A cumulative total of eighty-four (**84**) participants registered for the course. The attached attendance register indicates that daily attendance varied from 70 to 72 during the five-days training course. The round table discussions held on the sixth day (June 12, 2021) was attended by a total of **44** participants. **Appendix A** is the course and seminar attendance register. The registered participants represented seven (7) countries, including 63 participants from Tanzania, 7 participants from Mozambique, 4 participants each from Kenya and Cameroon, and 2 participants each from Namibia, Sierra Leone and Liberia. The participants from Tanzania are mainly from TANROADS (15), RFB (17), TARURA (11), Ministry of Works and Transport (6) and TARA (9). Others were from National Institute of Transport, University of Dar es Salaam, Dar es Salaam Institute of Technology (DIT), and a private consultant.

## 3.0 PRE-COURSE SURVEY RESULTS

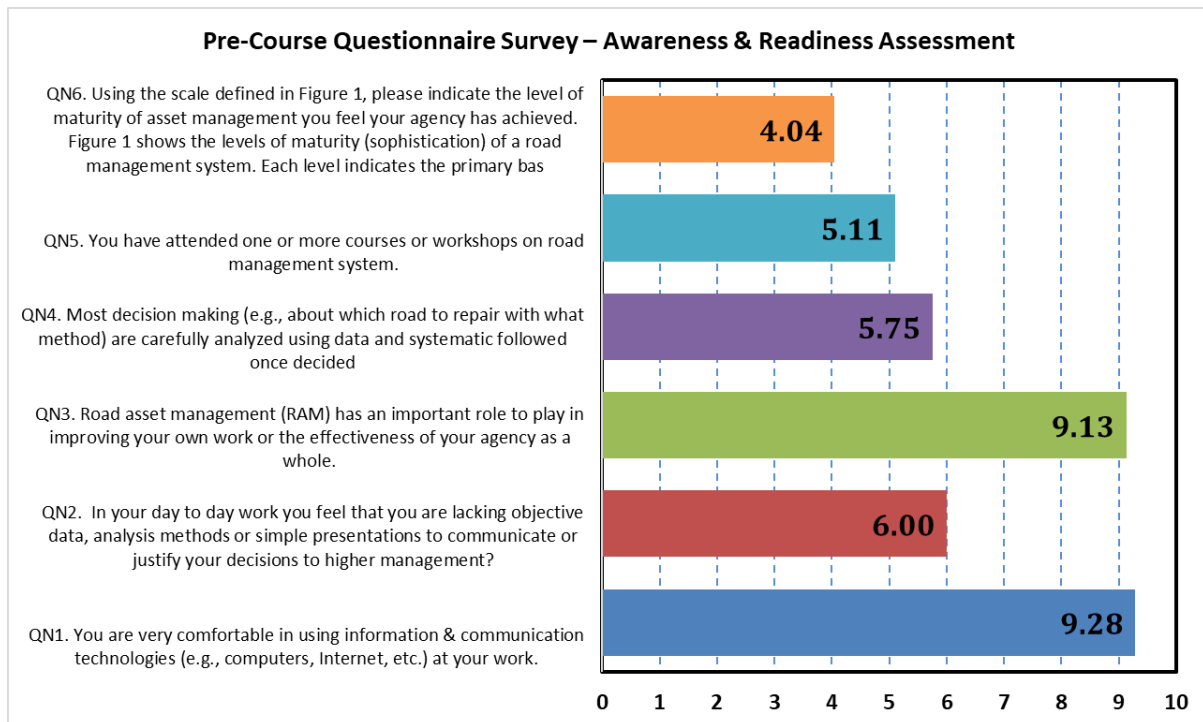
### 3.1 Overall Evaluation Goal

The overall goal of conducting pre-course evaluation was to capture in a quantitative way the existing level of awareness and readiness for road asset management. The survey provides a baseline of information on how each participant is *technology-ready* or “*comfortable*,” how he/she perceive the importance of road management system, role of analyses in decision-making; and also identify some perceived areas of need in their agencies. An important goal of the survey was to benchmark or capture how the participants feel about the maturity of road asset management system in their agencies. The course participants were also asked to give comments on key barriers or challenges that may negatively impact on growth of road management system; and to identify areas that need improvement.

### 3.2 Pre-Course Quantitative Results

The responses to the first six questions of the pre-course questionnaire – that were all asking for a numerical rating [in a scale of 1 – 10, for questions 1 to 5], are summarized in Figure 1 below.

As seen in Figure 1, when the participants were asked, if they were “*very comfortable in using information & communication technologies (e.g., computers, Internet, etc.) at work*” the average response was 9.3. This suggests that the participants had a relatively good confidence on their skills in the use of computers. However, this is simply a personal “perception” and may not reflect the real level of fluency in day to day use of computers and information technologies to improve their decision-making or work productivity.



**FIGURE 1. Summary of pre-course questionnaire responses**

In response to Question 2, when the participants were asked if they were “*lacking objective data, analysis or presentations methods to communicate or justify their decisions to higher management,*” the average response was 6.0 [on the scale 1-10]. This suggests that most participants recognize that there is need for improved tools, analysis methods and the like to enhance their ability to support decisions and communicate them to higher level. This is noteworthy, given that the opinion was before being exposed to the road asset management course content.

In response to Question 3, when they were asked if, “*Road asset management system (RAMS) has an important role to play in improving their work or the effectiveness of your agency,*” the average response was 9.1. This is a good indicator that all participants place a very high importance on the role of Road Asset Management System in their agencies. This relatively high score suggests that the participants will be open and supportive to any future steps to improve or even fully implement a comprehensive road asset management system in their road agencies/authorities.

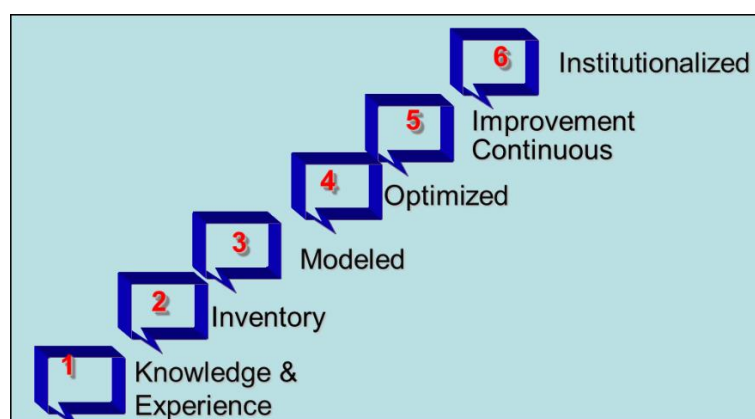
To Question 4, which asked, if “*Most decision making (e.g., which road to repair with what method) are carefully analysed using data and systematic followed once decided,*” the average response was 5.75 [on the scale 1-10]. This, middle of the scale score, suggests that participants see a need for more systematic approach to support decision-making

based on analysis of data. Again, this is notable, given that it is a perception voiced by the participants even before they undertook the course.

Figure 1 also shows that the average response to Question 5, (asking if participants had a prior exposure to road management system), was a low score of **5.1**. This is an indication that many staff in the Sub Saharan Africa region do not have a good exposure to concepts of road asset management. This suggests that there is a need of more elaborate and extensive programs of training and capacity building of the technical staff in road agencies to disseminate the important concept of road asset management system.

Finally, Figure 1, shows that the participants rated the maturity or capability of road management system of their agencies (mostly in Tanzania) at **4** [on a scale 1 – 6]. The scale used (see **Figure 2**) is the so called the *Infrastructure Management Maturity Model* (IM<sup>3</sup>) proposed by Mrawira and Wlaschin (2009). The score of 4 [optimized] is obviously higher compared to a realistic bench-mark of the current practice of RAM in Sub Saharan Africa. This score probably draws from the fact that the current practice in the most Sub Saharan Africa region relies on carrying out lifecycle analysis (e.g., using HDM4) to prioritise road investments.

These pre-course ratings will be compared to the post-course rating of the level of maturity of road management by the participants after completing the course. Their knowledge and awareness of asset management is expected to change how they perceive the level of maturity (and need for improvement) of the current practices of asset management in their agencies. This comparison is subsequently presented in Section 4 of this report.



**FIGURE 2.** *The scale used to assess the maturity of a road management system (adapted from Mrawira and Wlaschin (2009))*

### 3.3 Pre-Course Identified Barriers and Areas for Improvement

The pre-course questionnaire included two “free form” questions that asked the participants to comment or write out their ideas. Question 7 asked the participants to identify three main barriers or challenges that may limit maturity of road management system at their agencies. Key barriers identified are summarized in Table 2. The most common barriers raised include:

- Financial Constraints / Constrained maintenance budget/ Insufficient/Shortage of fund. (*Raised by 32 respondents out of 53*).
- Lack of skilled manpower/expertise; Lack of technical capacity, Lack of training and adequate awareness in RAMS; lack of knowledge on asset management at all levels. (*Raised by 24 respondents out of 53*).
- Awareness level to stakeholders is low; Buy-in by policy makers; Lack of decision makers support to give the importance that is needed for the Asset Management Issue; Political interference - Maintenance of existing roads is not taken very serious compared to the new construction. (*Raised by 21 respondents out of 53*).
- Lack of accurate data collection; high data Collection cost; Lack of equipment/facilities such as condition surveys and traffic data and software; Lack of reliable analysis tools.

Finally, Question 8 of the pre-course survey elicited comments on three areas of road management system that need improvement. Table 3 summarizes the responses from the participants. The most common areas suggested for improvement are:

- Improve the planning to adopt RAMS approach, prioritization and allocation of resources for maintenance, enhancing capacity of staff on RAMS concepts.
- Training (education to all stakeholder external and internal); Training of staffs; Training manual;
- There is a need to develop curriculum and introduce the teaching of Road Asset Management (RAM) in our educational & research institutions.
- Adopt trade-off analysis over all asset types.
- Pursue the government to set aside funds (“Marshall Plan”) for addressing poor conditions of a huge network of district roads.
- Setting aside satisfactory funds for maintenance.
- Proper use of the system approach in decision making & in planning instead of arbitrary human judgement.
- Develop internal capacity to implement and manage RAMS.
- Integration of RMS (TANROADS) and DROMAS (TARURA) for easy by key stakeholders; Integration of the existing RAMS for ease of access of data.



**TABLE 2. Barriers or Challenges Limiting the Maturity of Road Management System**

| <b>Responses of Course Participants on Main barriers or challenges that may be limiting or slowing the maturity of road asset management system in their Agencies</b>   |
|---|
| <ol style="list-style-type: none"> <li>1. Budget constraints.</li> <li>2. External factors.</li> <li>3. Education/knowledge on asset management to all level.</li> </ol>  |
| <ol style="list-style-type: none"> <li>1. By laws.</li> <li>2. Politician (decision makers).</li> <li>3. Lack of Funds.</li> </ol>  |
| <ol style="list-style-type: none"> <li>1. DROMAS not yet completed.</li> <li>2. Scope creep in developing DROMAS.</li> <li>3. Ownership of the system hinder inclusion of the important data.</li> </ol>  |
| <ol style="list-style-type: none"> <li>1. Environment on technology infrastructures required to how RAM used by all Agency and Road Fund Board.</li> <li>2. Personnel training.</li> <li>3. Political interference on deciding the required infrastructures.</li> </ol> |
| <ol style="list-style-type: none"> <li>1. Funds not enough.</li> <li>2. Skills - Many technical required to run RAMS have low skills.</li> <li>3. Vehicles &amp; Machines for doing survey and assessment.</li> </ol>   |
| <ol style="list-style-type: none"> <li>1. Funds; The fund released is to constrained only 13% of unconstrained budget is fulfilled.</li> <li>2. Shortage of personnel (experts)</li> <li>3. Training; Institution need more training and knowledge transfer.</li> </ol> |
| <ol style="list-style-type: none"> <li>1. Insufficient Funds.</li> <li>2. Poor maintenance of the system.</li> <li>3. Most developers are from outside Tanzania.</li> </ol>   |
| <ol style="list-style-type: none"> <li>1. Insufficient/Shortage of fund.</li> <li>2. Lack of committed Technical Personnel.</li> <li>3. political will - That is political interference.</li> </ol>   |
| <ol style="list-style-type: none"> <li>1. Lack of enough knowledge among Institution workers.</li> <li>2. Shortage of Funding.</li> <li>3. Shortage of staffs at all levels.</li> </ol>   |
| <ol style="list-style-type: none"> <li>1. Lack of proper software for Roads Asset Management.</li> <li>2. Lack of professionalism in RAM.</li> <li>3. Lack of enough Funds.</li> </ol>  |
| <ol style="list-style-type: none"> <li>1. Lack of skilled manpower/expertise.</li> <li>2. Technical changes.</li> <li>3. Rigidity of decision makers in policies and related issues.</li> </ol>   |
| <ol style="list-style-type: none"> <li>1. Lack of sufficient Funds.</li> <li>2. Prioritization of Asset Management.</li> <li>3. Political decision.</li> </ol>  |
| <ol style="list-style-type: none"> <li>1. Level of funding to the RAMS.</li> <li>2. Political willingness.</li> <li>3. Little budget allocations.</li> </ol>  |
| <ol style="list-style-type: none"> <li>1. Limitation of Funding.</li> <li>2. Disjoint skills, that are not integrated.</li> <li>3. Lack of committed Engineers in building the RAMS.</li> </ol>   |
| <ol style="list-style-type: none"> <li>1. Limitation on human resources.</li> <li>2. Lack of decision makers support to give the importance that is needed for the Asset Management Issue.</li> </ol>   |
| <ol style="list-style-type: none"> <li>1. Limited human capacity in the institutions.</li> <li>2. Weak institutional coordination in development and management of RAMS.</li> <li>3. Limited Funding.</li> </ol>  |
| <ol style="list-style-type: none"> <li>1. Not enough data on the Roads hence our intervention is not science driven as yet.</li> </ol>  |
| <ol style="list-style-type: none"> <li>1. Political acceptability.</li> <li>2. Funding.</li> <li>3. Technology / Accessibility.</li> </ol>  |
| <ol style="list-style-type: none"> <li>1. Political decision making.</li> <li>2. Engineering skills.</li> <li>3. Financial availability.</li> </ol>   |
| <ol style="list-style-type: none"> <li>1. Shortage of skilled and knowledgeable manpower particular in RAM.</li> <li>2. Lack of facilities such as Roads and traffic data and software.</li> <li>3. Lack of Fund.</li> </ol>  |
| <ol style="list-style-type: none"> <li>1. Skills to key staff.</li> </ol>   |

## Responses of Course Participants on Main barriers or challenges that may be limiting or slowing the maturity of road asset management system in their Agencies

2. Awareness level to stakeholders is low.

3. ICT infrastructures being poor in some locations.

1. Technical knowhow.

2. Resources reorganization.

3. Management consideration to dedicate.

1. The concept of AMS not yet taken in board.

2. AMS not yet politicized.

3. Maintenance of existing Roads is not taken very serious compared to the new construction.

1. Web-based connection at time you are out of the office and you need some data.

2. More training on the use of the system.

3. Funding.

1. CAPACITY (Human and Institutional).

2. Resources.

3. Buy-in by policy makers.

1. Constrained maintenance budget.

2. unsustainable maintenance financing.

3. lack of reliable analysis tools.

1. Inadequate Fund.

2. Political interferences.

1. Inadequate Fund.

2. Political interferences.

1. Lack of appropriate equipment.

2. Lack of accurate data collection.

1. Lack of funding to set up the AMS.

2. The political choice to implement the AMS.

1. Lack of knowledge.

2. Political interference.

3. Lack of Resources.

1. Lack of political/key decision maker.

2. Uncoordinated effort by different Agencies.

3. Inadequate Fund.

1. Lack of training on the usage of the system.

2. Resistance to change from manual operation to automation for the Road Agency staff.

3. System limitation or capabilities in terms of functions.

1. Limitation of Network to some areas.

2. Training.

3. Technology.

1. Number of staff aware of the system.

2. Lack of commitment to use the output from the system.

3. Data Collection cost.

1. Political interference.

2. Poor planning.

3. Low financial capacity.

1. Political interference.

2. Financial Constraints.

3. Technical Expertise.

1. Poor technical capacity.

2. Bad system of doing maintenance.

3. External interference in decision making.

1. Problem with division of responsibility to manage the Asset.

2. Lack of proper commitment of assigned part.

3. Inadequate Resources.

1. Technological changes.

2. Limited budget.

**TABLE 3. Areas of Road Management System Needing to be Improved**

| <b>Responses of Course Participants on Priority areas or aspects of road asset management that they felt their agencies will need to be improved.</b>   |
|---|
| <ol style="list-style-type: none"> <li>1. Adequate Training and technology transfer to many staffs as possible in the institution.</li> <li>2. There should be an optimal one of data collected and output.</li> <li>3. Updating the system to capture new processes/technology and practices.</li> </ol> |
| <ol style="list-style-type: none"> <li>1. Allow improvement of methodology of Data Collection.</li> <li>2. Adequate Funding.</li> </ol>   |
| <ol style="list-style-type: none"> <li>1. Best maintenance strategy.</li> <li>2. Necessary funding strategy to achieve the goals.</li> </ol>  |
| <ol style="list-style-type: none"> <li>1. Budget prioritization.</li> <li>2. Road Asset Management (Paved &amp; Gravel Roads).</li> <li>3. Unit for RAM.</li> </ol>   |
| <ol style="list-style-type: none"> <li>1. Capacity building of human resources at different level.</li> <li>2. High investment on equipment to measure strength of pavement and roughness.</li> </ol>   |
| <ol style="list-style-type: none"> <li>1. Condition survey for paved Roads be carried out twice a year involving Regions or Main Stakeholders.</li> <li>2. Increasing Funding by creates other source of Funds.</li> <li>3. Training provision to staffs.</li> </ol>                                      |
| <ol style="list-style-type: none"> <li>1. Conduct life cycle analysis.</li> <li>2. Trade-off analysis over all asset types.</li> <li>3. Adopt best maintenance practices.</li> </ol>  |
| <ol style="list-style-type: none"> <li>1. Data Collection.</li> <li>2. Resources.</li> <li>3. Data management software.</li> </ol>  |
| <ol style="list-style-type: none"> <li>1. Develop/prepare comprehensive user equipment.</li> <li>2. Develop internal capacity to develop and manage RAMS.</li> <li>3. Build capacity in monitoring and evaluation of roads maintenance intervention.</li> </ol>   |
| <ol style="list-style-type: none"> <li>1. Development of a single RAMS for all roads Agencies.</li> <li>2. Integration of the existing RAMS for ease of access of data.</li> <li>3. Proper use of the system in decision making instead of human intervention in planning.</li> </ol>                     |
| <ol style="list-style-type: none"> <li>1. Efficient funding of Roads Maintenance.</li> <li>2. Regular monitoring of the use of funding.</li> </ol>  |
| <ol style="list-style-type: none"> <li>1. Ensure the appropriate equipment, training and resource capacity.</li> </ol>  |
| <ol style="list-style-type: none"> <li>1. Explore alternative funding sources.</li> <li>2. Creates a repository for road data and ensure coordinated Road Management efforts.</li> </ol>  |
| <ol style="list-style-type: none"> <li>1. Facilitators in RAM.</li> <li>2. RAM curriculum.</li> <li>3. Training manual.</li> </ol>  |
| <ol style="list-style-type: none"> <li>1. Fixed asset management and expansion programs.</li> <li>2. Fixed asset management and compliance aspects.</li> <li>3. Living the standards.</li> </ol>  |
| <ol style="list-style-type: none"> <li>1. Have a RAMS in place.</li> <li>2. Conduct training to all involved staff.</li> <li>3. Awareness to all involved politicians.</li> </ol>   |
| <ol style="list-style-type: none"> <li>1. Improvement of Bridge Maintenance System.</li> </ol>  |
| <ol style="list-style-type: none"> <li>1. Increase Funding.</li> <li>2. Ensure all Roads are frequently monitored and reported are given 24/48 hours being attended.</li> </ol>   |
| <ol style="list-style-type: none"> <li>1. Increase the budget for the system.</li> <li>2. Search for new technology.</li> </ol>   |
| <ol style="list-style-type: none"> <li>1. Integration of RMS (TANROADS) and DROMAS (TARURA) for easy by key stakeholders.</li> <li>2. Development of single RAMS for National and District Roads.</li> <li>3. Eliminates human intervention in planning of Roads Maintenance works.</li> </ol>            |
| <ol style="list-style-type: none"> <li>1. MCA Parameters.</li> <li>2. CMM Module should be improved to contain Road Safety contracts and labour based contracts.</li> </ol>   |
| <ol style="list-style-type: none"> <li>1. People.</li> <li>2. Equipment /Instruments.</li> </ol>  |
| <ol style="list-style-type: none"> <li>1. Planning - long term plan for RAM about 20 years.</li> <li>2. Avoid external interference in decision making.</li> </ol>  |
| <ol style="list-style-type: none"> <li>1. Planning and budgeting processes.</li> <li>2. Strict law enforcement and policy implementation.</li> </ol>  |

### Responses of Course Participants on Priority areas or aspects of road asset management that they felt their agencies will need to be improved.

|   |
|---|
| 3. Use of technical experts in planning, process and improvement of monitoring system.  |
| 1. Primary Roads.<br>2. Improvement of the vertical and horizontal signals on the Roads.  |
| 1. Prioritization of project.<br>2. Preparation of strong Data base and inventory of the road asset.<br>3. Investment in Capacity Building.   |
| 1. Produce an efficient maintenance.<br>2. Program with allocated funds and periodicity.  |
| 1. Proper data collection and entry in the system.<br>2. stable and sustainable budget for asset management.<br>3. Close and tight supervision of asset maintenance works.  |
| 1. Review its institution setup reduce duplication.<br>2. Increasing staffing level especially at the council's level.<br>3. Pursue the government to set aside Funds for developing a huge network of district Roads that is in poor conditions. |
| 1. Road (Rural Roads).<br>2. Bridges.<br>3. Culverts. 4.Finance.  |
| 1. Strong Financial Arrangement.<br>2. Prioritization Tools.<br>3. Equip Technical Expertise in implementing RAM.   |
| 1. System Calibration.<br>2. System Adjustment.<br>3. To be upgraded to integrated Web-based system.  |
| 1. There is a need of introduction of RAMS in our institutions.   |
| 1. To merge with other Roads Agencies system and to be Web based.<br>2. Provision of many Training by Institutions. 3. Increasing Funds.  |
| 1. Training (Education to all stakeholder External and internal).<br>2. Making sure that laws and regulations are followed without interfere.<br>3. Focus on maintaining the newly upgraded roads.  |
| 1. Training of staffs.<br>2. Re-fronting alignment with RAM.<br>3. Access to the RAM managed by Road Agency.  |
| 1. Training to TARURA staff on RAM.<br>2. A simplified mode for Data Collection on Roads conditions.  |
| 1. Training.<br>2. Implementation.<br>3. Allocation of Fund for Data Collection.  |
| 1. Understand the AMS and its importance should be apriority.<br>2. Setting Aside Satisfaction funds for maintenance.   |
| 1. Use of experience we have to continue to analyze and prioritize our Roads management as an important asset while waiting to put the system in place.   |

## 4.0 POST-COURSE SURVEY FINDINGS

### 4.1 Goal of the Post-Course Evaluation

The post-course evaluation had two primary goals:

- The first part of the questionnaire was deigned to evaluate the quality and effectiveness of teaching/presentation on module by module basis. Comments were also solicited to clarify specific areas of the course that may need improvement in future offerings.
- The second part of the questionnaire was designed to ascertain the overall impression about the course. The focus here was to try and quantify how useful the course was to the participants and to the agency.

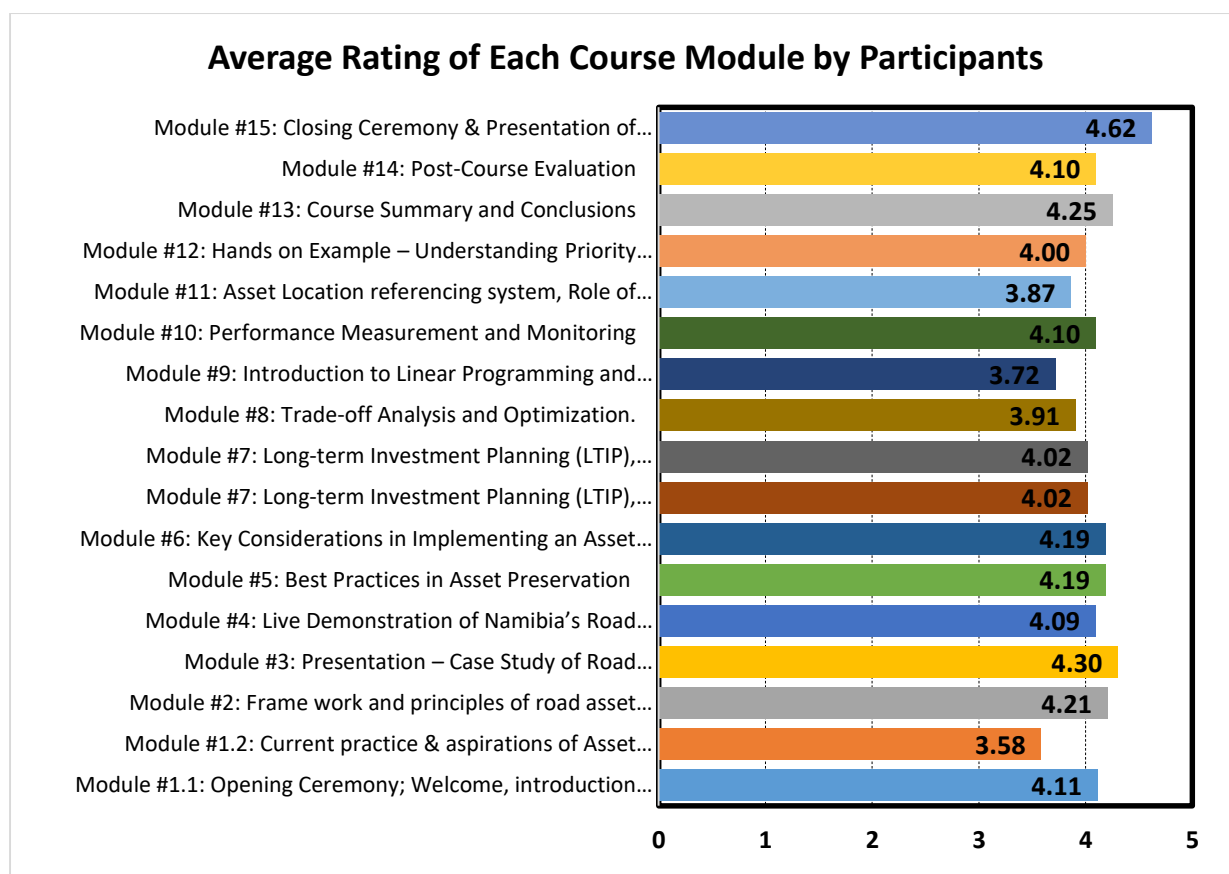
Specific questions in the second part dealt with opinions on valuable aspects of the course, impact the course may have on participants' work/actions, any new skills gained, and new perception on role of road asset management system. Other questions dealt with the quality of the interaction between instructors and participants, and if asset management system will improve work at their agencies. As with the pre-course survey, the post-course asked participants to give a new rate on the maturity of road management system in their agencies using the same IM<sup>3</sup> scale in Figure 2 (Mrawira and Wlaschin, 2009). Finally, participants were asked to identify areas that may need improvements.

## 4.2 Module by Module Course Assessment

Figure 3 presents a summary of module by module evaluation by participants during the last day of the course. A total of 53 participants completed the post-course evaluation questionnaire. It is seen from the figure that the overall ratings for the course modules are generally very good. The overall average rating is **4.1** on the scale of 1 – 5, where 5 is the highest. This is equivalent to **82%** and shows that the participants had a relatively very good impression of the regional seminar and course. It is worth noting that the modules that received the highest rating (equivalent to 84% and above) are (i) the Framework and Principles of Asset Management, (ii) the Case Study Presentation of Namibia Road Management System, (iii) the Best Practices in Practices in Asset Preservation, (iv) Key Considerations in Implementing Asset Management, and (v) the Course Summary and Conclusions.

The relatively high ratings of the foundational topics on *“the Framework and Principles of Asset Management,”* and the wrap up *“the Course Summary and Conclusions,”* are very encouraging and indicate that in overall the participants acquired the basics of asset management that may translate to some follow up actions in their agencies.

It is interesting to observe that one courses module, *“Introduction to Linear Programming and Strategic Level Cross-Asset Optimisation,”* received the lowest rating of 3.7 (74%), and two other course modules, *“Trade-off Analysis and Optimization”* and *“Asset Location referencing system, Role of GIS and GPS; Data and Database Issues”* received the next lowest rating of 3.9 (78%). The rest of the course modules were rated at an average rating of 4.0 (80%) or above. The low ratings of the three course modules (dealing with linear programming, optimisation, GIS/GPS and database issues) may be a result of the academic/technical background of the senior management staff who were the majority in the pool of participants. The highly technical or mathematical concepts in the above modules were not easily assimilated or of much value to this calibre of participants.



**FIGURE 3. Summary of post-course module by module evaluation by participants**

## 4.3 Part II Post-Course Evaluation: Overall Impression

### 4.3.1 Comments on Individual Modules

**Appendix C** presents a summary of comments made by participants on each individual module of the seminar/course alongside their numerical rating of the module. In overall, these are valuable suggestions that need to be considered and captured in future offerings of such seminar/course. Some of the comments are worth review in determining follow-up action items for road asset management in Tanzania.

### 4.3.2 Participants' Comments on the Overall Impression of the Course

**Appendix D** presents the detailed comments from the Part II of the post-course questionnaire. Each table presents the results or response of the participants to a given question. In this section, the report summarizes the most important comments. The importance was judged by how frequently they were repeated.

As seen from Table D1, from the participants' point of view, the most valuable aspect of the course include: (1) Framework for Road Asset Management; (2) The importance of preservation of national assets; (3) Importance of Asset Management; (4) Exchange &

sharing on how institutions in different countries are managing the roads assets; (5) The framework and principles of Asset Management especially how to improve “*Block 2*” (long-term planning / Resources allocation) and *Block 5* (Monitoring and Evaluation); and (6) the emerging new elements of RAMS, e.g. the implications of ISO 55000 standard.

Table D2 presents comments on the least valuable aspects of the training that include: (1) The time seem to be limited to elaborate in details some important aspects in RAM. (2) All modules were relevant therefore valuable in relation to the course. (3) Asset location GIS and GPS; and Demonstration of linear programming; (4) Breakaway sessions would have served to break the monotony of presentation. The lack of breaks, break-out group, lack of group meetings, etc. reduce the sharing experiences. (5) Next time they may add more presenters. (6) Some aspects were too technical for senior executive and decision makers. And (7) The daily schedule were too long (up to 17:00) for senior executives who have other issue to attend. These are all valuable inputs that should be considered in the planning for the next training and seminar.

Table D3 shows comments on possible follow up actions by participants. Some of the comments include: (1) Knowledge transfer/ educate other staff on RAM; (2) Implement performance measurement in our agency, (3) Improve RAM tools, (4) Promote mind-set change of my colleagues on the need of preservation of asset management / Convince the management to change the culture we have to think more of road maintenance than development works; (5) Consider including RAM in Performance Agreements (between Road Fund Boards and Implementing Agencies); (6) Change the way of doing things with the thesis, “*you can’t manage what you don’t measure*” (7) Need to include the RAMS in teaching & content in our schools’ curricula; and (8) Change organisation culture to make use of technology system to achieve maximum efficiency.

Table D4 presents comments on how the training has equipped participants with new skills that can be used in their daily activities. Some interesting comments include: (1) Keep good roads in a good condition by applying right types of maintenance at the right time; (2) Improve the area of resource allocations; (3) Improve the area of monitoring and evaluation (feedback); and (4) the training opened our mind in view of the discipline of asset management.

Table D5 is a long list of comments of the participants on how has the training affected the view of the role of road asset management system in serving their agencies. Some of the comments include: (1) I have realised that areas that needs improvement especially on resources allocation (long term planning) and monitoring and evaluation (feedback); (2) I learned that in the context of budget constraints, which is the Mozambican case, the best way to achieve good optimization of using budget is through the AMS; (3) In the first

place, I thought AM is for engineers only but now I know in order to make it better and for good result Asset Management is for everyone; (4) Value utilization and value preservation have to go hand in hand so as to sustain the achievement made so far; (5) It totally changed my view of the role of Road Asset Management System. From now on, I am going to rely on metrics to take any decision; (6) RAM is the key to ensure that roads are preserved in serviceable conditions. The optimization ensures that funds are utilised optimally and value for money is achieved; and (7) RAM system is the tool to support decision making and is a part of RAM framework.

Table D6 shows comments on the Question, “Did the trainers respond adequately to your questions?” The average rating was **4.46** [on the scale 1 to 5]. Some of the related comments include: (a) Absolutely yes; (b) there was a good exchange of experience from other countries. (c) The resource person Prof. Mrawira is the best not only in Asset Management practice but also he is experiences well both for Tanzania and abroad. Big up to him. (d) Yes, all issues related to RAM are well addressed. And (f) Yes, most of time they responded with real examples that was very good and understandable.

The relatively short Table D7 presents the results on Question 7. In response to the question, “How would you rate the overall quality of the workshop?” the average rating of all the respondents was **4.16** [on the scale 1 to 5]. This is equivalent to 83%.

Table D7 is very short. It shows a summary of the responses to the question that asked if road asset management system will improve their work and or effectiveness their agencies. A total of **43** (out of 53) participants responded “yes.” The rest of the participants left the question blank.

Table D8 is a summary of post-course estimation by the participants of the maturity level of road management system in the region. The intention was to compare this score with the pre- course estimation taken before the course. As seen in Table D8, the average score for all the represented countries is **3.18** [on the scale 1 – 6]. It is interesting to note that this revised bench-marking of the current maturity of RAM in the region is relatively lower than the pre-course assessment of 4.04. This reduced level the current maturity assessed in this round is a result of the participants gaining a deep appreciation of the basic concept of asset management and its requirements, including aspects such as ISO 55000 standard implications.

A few participants gave specific ratings for their agencies. The average rating of maturity for Mozambique ANE, Kenya Road Board, and Ministry of Works & Transport (T) was 2.0. The maturity rating for Tanzania Road Fund Board was **3.7** whereas for TANROADS and TARURA were 4.0 and 3.3, respectively. Finally, the RMFA was rated 4.0.



Table D10 shows the comments on the question, “List three key areas of asset management that you feel need to be improved in the short term to make Road Asset Management System better at your agency.” A sample of the comments include: (1) Enhance organisation mind-set / Make the government understanding the importance of RAMS / Awareness campaign to management and staff in general on the importance of RAMS; (2) Appropriate communication to key decision makers to attain buy in and political good will / Senior Management need to support adoption of Asset Management; (3) HR improvement in terms of training and recruitment; (4) Implementation of RAMS by all agencies; (4) Sensitization of RMS to all stakeholders; (5) Importance of long-term planning and traditional planning; (6) Importance of performance measure, monitoring and feedback; (7) Asset information management system to be more holistic.

Other interesting general comments included:

- Recommend the Ministry of Education to include the AMS in the college/university level. (Raised by multiple participants).
- Conduct tailored training to infrastructure development agencies and ministries. (Raised by multiple participants).
- Include multi-lingual translators who will smoothen communication during the course and seminar. Proposed languages are Kiswahili, English, French and Portuguese.
- Learning session should be limited to maximum of 6 hours (per day) for efficient and understanding the materials.
- More stakeholders should be encouraged to attend this course.
- Site visits and tours are important so that costs are incorporated in the formal invitation.
- Consider factoring in the site visits, session for sharing and interactions including a cocktail and farewell dinner (you can factor all this in the costs). (Raised by multiple participants).
- Future seminars need to incorporate small group works to foster more discussions between participants especially those from other country.

## **5.0 FINDINGS ROUND TABLE DISCUSSIONS FOR DECISION-MAKERS'**

### **5.1 Welcome & Opening Session**

In this session, first the Course Lead Facilitator welcomed the participants to the round table discussions. He then proceeded to make a PowerPoint presentation on Introduction & Seminar Objectives. The presentation provided an Overview and Highlights from the 5-Days RAM Course. The presentation was broken down in five parts: (i) Status of RAMS Practices in the Region; (ii) Introduction and Benefits of Asset Management; (iii) Key Issues shared among delegates during the course; (iv) ISO 55000 and its implications, and (v) Conclusions.

This section outlines some of the key things presented. The lead facilitator shared from the course that current status of Asset Management practice in the region is at varying levels of maturity.

- Some countries are yet to complete Road Sector Reforms;
- Some road authorities are in early stages of implementing RAMS;
- Some countries have road management systems that are relatively mature – yet not aware of the ISO 55000 requirements.

Most countries with or implementing Road Asset Management suffer from:

- Most countries still manage assets in silos, i.e. RMS, BMS, etc. independently.
- No country has fully Cross-Asset Trade-off capabilities.
- Most countries have no top-down ownership & support of Road Asset Management; no linkage with Corporate Strategic Plans.
- Most countries have no robust mainstreaming (mindset change) plans.

The Lead Facilitator shared some key issues shared among delegates during the five-days course. They include:

- Serious gap or shortfall in road maintenance funding.
- Frequent interference by politicians – to allocate road funds monies arbitrarily especially to capital and rehab works.
- Limited understanding by politicians & governments of the ***User-Pay Principle*** i.e., road sector reforms.
- Road funds and road authorities do not have required autonomy from line ministries.
- Road funds are not ring-fenced in several countries – hence unreliable maintenance financing.
- Fuel levy as the dominant source of road fund monies – while the future of electric and gas-powered cars is imminent.
- An increasing backlog in rehabilitation and reseal.
- Need to build capacity of local contractors and consultants; and
- Innovative contracting e.g., Output & Performance-based Road Contracts (OPRC) to ensure acceptable level of service of key corridors.

Finally, the Lead Facilitator summarized the concept and implications of ISO 55000 standard. ISO 55000 standard series represents a global consensus on what Asset Management (AM) is and what it can do to increase the value generated by agencies. ISO 55001 can help the road agencies to create a world class asset management system, build long-term resilience, achieve value for money goals, and meet regulatory requirements. ISO 55001 helps to add value by providing agencies with an agile framework to help connect asset management with the achievement of corporate strategic goals.

From ISO5500 perspective, Asset Management (AM) is defined as, "*the systematic and coordinated practices through which an organization optimally and sustainably manages its assets and asset systems, their associated **performance, risks** and expenditures over their **life cycles** for the purposes of achieving agency's strategic plan.*" It entails the **integration of business processes** and practices, as well as the supporting **documentation and records' systems** across multiple departments. AM consists of a framework for linking asset management practices with Agency strategy dealing with **business risks**, targeting asset investment and operational plans, *definition of accountabilities and competencies*, **continuous improvement and change**. AM applies to an **agency's entire physical asset portfolio** and deals with the important interfaces with other corporate assets such as **IT, HR, financial and even goodwill**. AM System must deal with **all phases of an asset's life cycle** from initial conceptualization through to disposal and site remediation.

Some of the implications of ISO 55000 outlined in the Lead Facilitator's presentation include:

- ISO 55000 motivation is to achieve an agile agency, with robust timely decision-making to derive maximum value of all assets;
- We need integration of business processes and practices, and the supporting Records & Document Management System (EDMS) across multiple departments;
- This implies total digital transformation (not digitization!) is a necessity;
- We need a framework for linking AM practice to RA's Corporate strategy;
- Enhanced management of business risks;
- Ensure fully optimized long-term & operational plans;
- Capture & document staff accountabilities & competencies, and
- A robust Continuous Improvement Plan, & a robust Change Management strategy

In responding to a question raised on his wrap-up presentation, the Lead Facilitator commented that asset management can be implemented by different agencies, and we can start now. The focus should not be on Information Technology (IT) systems. ***We need to remove the "s" from the RAMS.*** What matters, in Road Asset Management is not the system (IT aspect), the IT is just a tool to support (e.g., data, information and analysis, etc.) the management of assets. RAM can only be scoped according to competency of the staff and the maturity of policies & procedures in the agency. He emphasized that Asset Management must appropriately scoped to ensure "*competent personnel use mature business processes with appropriate IT systems to manage the assets.*"

Furthermore, his key recommendation is to *keep eye on the good assets first (before rehab or re-construction)*, and to ensure that the road Asset are timely maintained to avoid rapid deterioration.

## 5.2 Highlights from the Opening Remarks

Highlights of Opening Remarks by Prof. Shemdoe:

- The seminar will come out with communicable recommendations for betterment of our countries.
- Summary and recommendation would faster social economic growth.
- Ensure that the Roads Asset is properly managed.
- Come out with proper and recommendations for growth of Roads.

Comments from Namibia AMFA Chief and CEO's: Africa needs to catch up with Roads Asset Management.

## 5.3 Key Findings from Round Table Topics #1 & 2

***TOPIC #1: Most countries have a road fund board and two or more road authorities (implementing agencies). What are the pros and cons of implementing ONE Road Asset Management System? What is the preferred option?***

- Comments from the CEO of TARURA: Recommended the country to have one Asset management system each Agency to own and operate it is own interface.
- Comments from TANROADS Rep. (Eng. Mlavi): Recommended two systems each Agency to manage his own road Asset managed system. Each Agency to have the independent road Asset managed but roads fund board to the have a system which will integrate and receive the data and report.
- Comments from Kenya Road Board (KRB) CEO: Preferred to have one strong RAM system for all road agencies and counties. Recommendations is developing one road Asset managed system; it is more cost-effective for the country.
- Liberia Experience: Not all roads have the same characteristics / needs. Each road agency has their own system to manage the road according to where they want to go.
- Comments from TA to TARURA: The preferred option is to have one Road management system (RAMS) for the country but the different Agencies to have acceptable interfaces to the one national system. A second option is to have different RAMS system in each road agency and the RFB to have interface or integration (to have access to different systems).

## 5.4 Key Findings from Round Table Topic #2

### **TOPIC #2: *Many countries are facing an increasing Gap in Road Maintenance Funding. What are the possible solutions & recommendations?***

- We need to think in holistic approach. Fuel consumption globally is declining due to alternative energy sources that are discovered with other technologies being invented. Should we think of new sources for road fund moneys as there might be a shift on the use of fuel as a source of energy?
- Badly dilapidated roads require rehabilitation, not repair. What should be done? Using Roads Fund money for rehabilitation is basically double-charging road users instead of all tax payers. This will have a negative effect of increasing maintenance burden to the nation – since compromise on maintenance will result in increased backlog and need for rehabs and reconstruction down the road.
- (Given the funding gap) Focus on (i) save the good roads (keep the good roads good); (ii) Save the road user (minimize transport costs, ensure smooth roads).
- Let the governments develop “*Marshall Plans*” to revive the failed roads.
- We have to think of alternative sources for road maintenance funds due to change of technology. Road fund will decrease year after year, now the electric vehicle has been introduced.

## 6.0 CONCLUSIONS AND RECOMMENDATIONS

### 6.1 Conclusions

The report presents a post-course evaluation of training and seminar conducted at AICC, Arusha from June 7<sup>th</sup> – 12<sup>th</sup>, 2021. The course, titled the “Regional Seminar and Course on Road Asset Management Systems for Senior Executives and Decision Makers” was facilitated by Professor Donath Mrawira as the Lead Resource Person.

The course and seminar had the goal of introducing and developing practical understanding and the application of road asset management concepts to a road agency. Emphasis was directed towards highlighting best practices in key function areas such as resource allocation, strategic level planning, the use of modern analysis tools, especially mathematical optimization in long-term strategic planning. Specific course objectives included understanding the fundamentals of road asset management; understanding related technical concepts such performance measurement; learn best practices of maintenance and preservation of road infrastructure; and acquiring a basic understanding of requirements for implementation of asset management.

A total of forty-four (84) participants registered and an average of 70-72 participants attended all the course modules. A total of 67 participants attended for the full 5 days. The Saturday decision-makers' seminar was attended by a total of 44 participants.

A pre-and post-course evaluations were conducted at the beginning and at the conclusion of the course. The goal of the pre-course evaluation was to quantify the existing level of awareness and readiness (or support) for road asset management.

### ***6.1.1 Findings & Conclusions from the Pre-Course Survey***

The report presents a post-course evaluation of training and seminar conducted at AICC, Arusha from June 7<sup>th</sup> – 12<sup>th</sup>, 2019. The course, titled the “Regional Seminar and Course on Road Asset Management Systems for Senior Executives and Decision Makers” was facilitated by Professor Donath Mrawira as the Lead Resource Person.

The course and seminar had the goal of introducing and developing practical understanding and the application of road asset management concepts to a road agency. Emphasis was directed towards highlighting best practices in key function areas such as resource allocation, strategic level planning, the use of modern analysis tools, especially mathematical optimization in long-term strategic planning. Specific course objectives included understanding the fundamentals of road asset management; understanding related technical concepts such performance measurement; learn best practices of maintenance and preservation of road infrastructure; and acquiring a basic understanding of requirements for implementation of asset management.

A total of forty-four (84) participants registered and an average of 70-72 participants attended all the course modules. A total of 67 participants attended for the full 5 days. The Saturday decision-makers' seminar was attended by a total of 44 participants.

A pre-and post-course evaluations were conducted at the beginning and at the conclusion of the course. The goal of the pre-course evaluation was to quantify the existing level of awareness and readiness (or support) for road asset management.

A significant number of participants (6 out 10) noted that their agencies are, “lacking objective data, analysis or presentations methods to communicate or justify their decisions to higher management.”

It interesting to observe that the large majority of the participants (9 out 10) agreed that “*Road asset management system (RAMS) will have an important role to play in improving their work or the effectiveness of your agency.*” This relatively high score suggests that the participants will be open and supportive to any future steps to improve or even fully implement a comprehensive road asset management system in their road agencies.

It's also noteworthy that participants pointed a need for more systematic approach to support decision-making based on analysis of data. Currently, most decision-making in managing road assets (e.g., which road to repair with what method) are not carefully analysed using data, and the analyses results are not systematic followed.

The results of pre-course survey identified several barriers or challenges limiting the growth/maturity of asset management system including: (i) Financial Constraints / Constrained maintenance budget/ Insufficient/Shortage of fund. (ii) Lack of skilled manpower/expertise; Lack of technical capacity, Lack of training and adequate awareness in RAMS; lack of knowledge on asset management at all levels. (iii) Low level of awareness among stakeholders; and hence lack of support by policy makers and decision-makers on the importance of the Asset Management Issue; (iv) Political interference (preferring new roads rather than maintenance. (v) Lack of accurate data collection / high data collection cost / Lack of equipment/ facilities e.g., condition surveys and traffic data equipment and software; and Lack of reliable analysis tools.

The pre-course questionnaire also identified key areas of RAMS that need to be improved as including: (i) Improve the planning to adopt RAMS approach, prioritization and allocation of resources for maintenance, enhancing capacity of staff on RAMS concepts; (ii) Training (education to all stakeholder external and internal); Training of staffs; Develop training manual on RAMS; (iii) A need to develop curriculum and introduce the teaching of Road Asset Management (RAM) in our educational & research institutions; (iv) Adopt trade-off analysis (maximize value for money) over all asset types; (v) Engage the government to set aside funds ("Marshall Plan") for addressing poor conditions of a huge network of district roads; (vi) The government need to raise satisfactory funds for maintenance to mitigate rapid loss of road assets and the high negative impact on the economy; (vii) Proper use of the system approach in decision making & in planning instead of arbitrary human judgement; (viii) Need to develop internal capacity to implement and manage RAMS; and (ix) Need for integration (or harmonisation) of the existing RAMS for ease of access of data.

On a positive note, the pre-course survey showed that participants believe that road asset management system (RAMS) plays an important role in improving their work or the effectiveness of their agencies. The relatively high score of **9.13** [out of max 10] suggests that the course participants will be open and supportive to any future steps to improve or implement a comprehensive road asset management system.

### ***6.1.2 Findings & Conclusions from the Post-Course Survey***

The post-course evaluation had two primary goals. First to evaluate the quality and effectiveness of teaching/presentation on module by module basis. Comments were also solicited to clarify specific areas of the course that may need improvement in future

offerings. The second part of the questionnaire was designed to ascertain how useful the course was to the participants and to their agencies, and also gather comments that could form part of recommendations for actions in road agencies and stakeholders.

With respect to the overall quality of the teaching of course, the participants gave an overall module by module average score of 4.1 [on a 1 – 5 scale], equivalent to **82%**. This shows that the participants had a very good impression of the course. From participants' point of view, all the modules were considered valuable and important.

The module by module rating showed that the modules that received the highest rating (equivalent to 84% and above) are (i) the Framework and Principles of Asset Management, (ii) the Case Study Presentation of Namibia Road Management System, (iii) the Best Practices in Practices in Asset Preservation, (iv) Key Considerations in Implementing Asset Management, and (v) the Course Summary and Conclusions.

The relatively high ratings of the foundational topics on *"the Framework and Principles of Asset Management,"* and the wrap up *"the Course Summary and Conclusions,"* are very encouraging and indicate that in overall the participants acquired the basics of asset management that may translate to some follow up actions in their agencies.

It is interesting to observe that one courses module, *"Introduction to Linear Programming and Strategic Level Cross-Asset Optimisation,"* received the lowest rating of 74%, and two other course modules, *"Trade-off Analysis and Optimization"* and *"Asset Location referencing system, Role of GIS and GPS; Data and Database Issues"* received the next lowest rating of 78%. The rest of the course modules were rated at an average rating of 80% or above. The low ratings of the three course modules (dealing with linear programming, optimisation, GIS/GPS and database issues) may be a result of the academic/technical background of the senior management staff who were the majority in the pool of participants.

With respect to second goal, the participants identified the most valuable aspect of the course include: (1) Framework for Road Asset Management; (2) The importance of preservation of national assets; (3) Importance of Asset Management; (4) Exchange & sharing on how institutions in different countries are managing the roads assets; (5) The framework and principles of Asset Management especially how to improve long-term planning / Resources allocation, and Monitoring and Evaluation; and (6) the emerging new elements of RAMS, especially, the implications of ISO 55000 standard.

Regarding course areas that could be improved, the participants pointed out the following: (1) the time seem to be limited to elaborate in details some important aspects



in RAM; (2) Asset location referencing, GIS and GPS; and demonstration of linear programming – were too technical or of limited value; (3) Breakaway sessions, group work/sessions, etc. should be considered to enhance learning and sharing experience; (5) There is a need of different presenters; and (6) Some course modules were too technical for senior executive and decision makers.

When asked what specific follow up actions they will take as result of the course, the most prevalent response of the participants included: (i) they will carry out advocacy and advice top management of their agencies on the importance of asset management; (ii) they will share their knowledge and try to plant a seed of RAMS within their colleagues; (iii) Promote mind-set change of my colleagues on the need of preservation of asset management / Convince the management to change the culture we have to think more of road maintenance than development works; (iv) Consider including RAM in Performance Agreements (between Road Fund Boards and Implementing Agencies); (v) Need to include teaching of Road Asset Management (RAM) and in our schools' curricula; and (vi) Change organisation culture to make use of technology system to achieve maximum efficiency; and (vii) Implement performance measurement in our agency.

When asked if the course has equipped the participants with new skills, the response was predominantly “yes.” Furthermore, the participants listed the following specific benefits or skills: (1) Keep good roads in a good condition by applying right types of maintenance at the right time; (2) Improve the area of resource allocations; (3) Improve the area of monitoring and evaluation (feedback); and (4) the training opened our mind in view of the discipline of asset management.

It was observed that the course has impacted on the participants' point of view with respect to the role of road asset management. Interesting comments were given, including: (1) I have realised that areas that needs improvement especially on resources allocation (long term planning) and monitoring and evaluation; (2) I learned that in the context of budget constraints, which is the Mozambican case, the best way to achieve good optimization of using budget is through the Asset Management; (3) In the first place, I thought AM is for engineers only but now I know for everyone – as the way to ensure value for money from road assets; (4) Value utilization and value preservation have to go hand in hand so as to sustain the achievement made so far; (5) It totally changed my view of the role of Road Asset Management System. From now on, I am going to rely on metrics (trade-off analysis) to take any decision; (6) RAM is the key to ensure that roads are preserved in serviceable conditions. The optimization ensures that funds are utilised optimally and value for money is achieved; and (7) RAM system is the tool to support decision making and is a part of RAM framework.

It was interesting to observe that the participants correctly scored the level of maturity of the practice of asset management in the region at **3.18** on the IM<sup>3</sup> scale of 1 – 6. This level is indicative of an agency that has done well in using agency staff knowledge and experience, and has a good inventory of its assets and is using lifecycle analysis to support strategic level planning and operational level resource allocations.

With respect to identifying key areas of asset management that need to be improved to make Road Asset Management better at the agencies, participants listed a number of useful responses. These include: (1) Need to enhance organisation mind-set; conduct awareness campaign / roll out communication plan targeting decision makers & senior management to understand the importance of AM and gain their support for adoption of Asset Management; (2) training of HR improvement in areas of AM skills; (3) Take steps to implement RAMS by all agencies; (4) Importance of long-term planning, and performance measure (monitoring and feedback); (5) Need for asset information management system to be more holistic (for all asset types).

The final post-course comments from the participants were directed on their overall view of the course and the relevance to their agency. The most dominant theme raised by the participants include: (1) Recommend the Ministry of Education to include the AMS in the college/university level. (Raised by multiple participants); (2) Conduct tailored training to infrastructure development agencies and ministries. (Raised by multiple participants); (3) Include multi-lingual translators who will smoothen communication during the course and seminar. Proposed languages are Kiswahili, English, French and Portuguese; (4) Future seminars need to incorporate small group works to foster more discussions between participants especially those from other country; (5) More stakeholders should be encouraged to attend this course; and (6) Site visits and tours are important so that costs are incorporated in the formal invitation.

### ***6.1.3 Findings & Conclusions from the Round Table Discussions***

The lead facilitator shared from the observations during course that current status of Asset Management practice in the region is at varying levels of maturity. Some countries are yet to complete Road Sector Reforms; some road authorities are in early stages of implementing RAMS; and yet other countries have road management systems that are relatively mature – yet not aware of the ISO 55000 requirements.

It was also observed from the countries represented that most countries with or implementing Road Asset Management suffer from five issues: (1) Most countries still manage assets in silos, i.e. RMS, BMS, etc. independently; (2) No country has fully *Cross-Asset Trade-off* capabilities; (3) Most countries have no top-down ownership & support of Road Asset Management; (4) Many countries do not have linkages between Corporate

Strategic Plans and RAM; and (4) Most countries have no robust mainstreaming (mindset change) plans to gain support of RAM among all stakeholders.

Some key issues shared among delegates during the five-days course include: (i) Serious gap or shortfall in road maintenance funding; (ii) Frequent interference by politicians – to allocate road funds monies arbitrarily especially to capital and rehab works; (iii) Limited understanding by politicians & governments of the **User-Pay Principle** i.e., road sector reforms; (iv) Road funds and road authorities do not have required autonomy from line ministries; (v) Road funds are not ring-fenced in several countries – hence unreliable maintenance financing; (vi) Hence an increasing backlog in rehabilitation and reseal in many countries; (vii) Fuel levy as the dominant source of road fund monies – while the future of electric and gas-powered cars is imminent; (viii) Need to build capacity of local contractors and consultants; and (ix) It may be worth to consider innovative contracting e.g., Output & Performance-based Road Contracts (OPRC) to ensure acceptable level of service of key corridors.

Regarding the first topic of round table discussions, *“What are the pros and cons of implementing ONE Road Asset Management System? What is the preferred option?”* diverging comments were raised. The Kenya Road Board (KRB) preferred to have one strong RAM system for all road agencies and counties. They are on the process of developing one road Asset managed system; it is more cost-effective for the country.

Not surprising, participants representing road agencies, argued that each agency should have their own independent road asset managed but roads fund board can have a system which will integrate and receive the data and reports from road agencies. A technical advisor for a road agency in Tanzania recommended two options. The preferred first option is to have one Road Management System (RAMS) for the country but the different road agencies to have acceptable interfaces to the one national system. A second option (less preferred) is to have different RAMS system in each road agency and the RFB to have interface or integration (to have access to different systems).

From the second topic of the round table discussions, *“Many countries are facing an increasing Gap in Road Maintenance Funding. What are the possible solutions & recommendations?”* several comments were raised:

- (1.) It was noted that using Roads Fund money for rehabilitation is double-charging road users instead of all tax payers. This will have a negative effect of increasing maintenance burden to the nation – since compromise on maintenance will result in increased backlog and need for rehabs and reconstruction down the road.
- (2.) Given the funding gap the focus should on (i) keep the good roads good (i.e., preservation first); (ii) minimize transport costs by ensuring smooth roads.

- (3.) Let the governments develop “*Marshall Plans*” to revive the failed roads.
- (4.) We have to think of alternative sources for road maintenance funds due to change of technology. Road fund will decrease year after year, now the electric vehicle has been introduced.

## 6.2 Recommendations

From the Regional Seminar and Course on road asset management that was conducted for a total of 84 participants from 7 sub-Saharan Africa countries the following recommendations were drawn from the pre- and post-course questionnaire surveys, and the round table discussions.

- (1.) It was recommended that road agencies, road fund boards and governments should take steps to address the identified barriers or challenges limiting the maturity of asset management including: constrained maintenance budget; lack of knowledge on asset management at all levels, i.e., low level of awareness among stakeholders and hence lack of support by policy makers and decision-makers on the importance of the Asset Management; political interference (preferring new roads rather than maintenance; and Lack of reliable analysis tools.
- (2.) It was recommended that similar courses should be organized road sector decision-makers to bring awareness on the importance of Road Asset Management (RAM). Tailored training on RAMS should target implementing agencies and ministries. More road sector stakeholders should be encouraged to attend the RAMS course.
- (3.) An awareness seminar on Road Asset Management System should also be organized targeting high level government officials at the policy level, e.g., road sector ministers, members of the Parliamentary Committees for Infrastructure Development and Budget, etc.
- (4.) The need to broaden exposure and technical skills in the key concepts of Road Asset Management System was emphasized. It was recommended that similar training courses and seminar should be continued to ensure as many technical personnel.
- (5.) Given the importance of Road Asset Management to national economies, it was recommended that the Ministries of Education should include a course of road asset management in the college/university level and other sector research institutions.
- (6.) The current level of maturity of asset management in region was estimated at an average of **3.1** on the IM<sup>3</sup> scale [with highest level being 6]. There should be a sustained capacity building on asset management in road agencies to ensure sustained growth to higher maturity levels.
- (7.) Road Fund Board (RFB) should consider using its Annual Performance Agreements with Implementing Agencies to ensure implementation and sustained maturity of Road Asset Management System in the roads agencies. Best Practices such as cross-

asset allocation of resources based long-term (20+ years) impacts should be emphasized and monitored by the Road Fund Board.

- (8.) Awareness campaigns should be sustained at all levels including targeting the media and the public on socio-economic merits of prioritizing the preservation of existing assets before acquiring new ones (i.e., importance of maintenance over capital budgets).
- (9.) With regards to agencies intending to implement or enhance their road asset management system, it is worth considering the identified priority areas of RAMS including: (i) consider the emerging new elements of RAMS, especially, the implications of ISO 55000 Standard – which represents a more comprehensive definition & requirements of RAMS; (ii) improve the planning approach by using prioritization by trade-off analysis (for maximize value for money) over all asset types and allocation of resources for maintenance; and (iii) Proper use of the system approach in decision making & in planning instead of arbitrary human judgement.
- (10.) Agencies should consider the ISO 55000 requirements of RAM, which include the systematic and coordinated practices through which an organization optimally and sustainably manages its assets and asset systems, their associated performance, risks and expenditures over their life cycles for the purposes of achieving agency's strategic plan. The ISO 55000 also requires the integration of business processes and practices, and the supporting document and records' systems across multiple departments. The ISO55000 consists of a framework for linking RAM practices with Agency strategy dealing with business risks, targeting asset investment and operational plans, definition of accountabilities and competencies, continuous improvement and change. Finally, the new standard requires AM to apply to an agency's entire physical asset portfolio and deals with the important interfaces with other corporate assets such as IT, HR, financial and even goodwill.
- (11.) Other national level recommendations include: (i) develop curriculum and introduce the teaching of Road Asset Management (RAM) in our educational & research institutions; (ii) Engage the government to set aside funds ("Marshall Plan") for addressing poor conditions of a huge network of district roads; (iii) Governments need to raise satisfactory funds for maintenance to mitigate rapid loss of road assets and the high negative impact on the economy.
- (12.) Regarding future offerings of the RAMS course, some areas can be improved including the following: (i) there is a need to increase the time to elaborate in details some important aspects in RAM; (ii) Some of the more technical modules, such as *Asset location referencing, GIS and GPS*; and *linear programming* – were considered of limited value to senior decision-makers. It is worth considering removing or simplifying/ shortening them; (iii) Breakaway sessions, group work/sessions, etc. should be considered to enhance learning and sharing experience; (iv) There is a need to increase the number of presenters/facilitators to broaden the experience sharing; (v) Include multi-lingual translators to smoothen communication during

the course & seminar. Proposed languages are Kiswahili, English, French and Portuguese; (vi) Site visits & tours should be incorporated in future course offering.

- (13.) Regarding the first topic of round table discussions, “*What are the pros and cons of implementing ONE Road Asset Management System? What is the preferred option?*” diverging comments were raised. The Kenya Road Board (KRB) preferred to have one strong RAM system for all road agencies and counties, since this is more cost-effective for the country. The road agencies from Tanzania preferred independent RAMS for each road agency with an interface for the Road Fund Board. Another noteworthy comment was that the preferred first option is to have one Road Management System (RAMS) for the country but the different road agencies to have acceptable interfaces to the one national system. The recommendation emerging from the round table would require more dialogue within each country and policy decision at the national level.
- (14.) Regarding the second round table discussion topic to find possible solutions and recommendations on the increasing gap in road maintenance funding, the following recommendations were made: (i) It was noted that using Roads Fund money for rehabilitation is basically double-charging road users instead of all tax payers. This will have a negative effect of increasing maintenance burden to the nation – since compromise on maintenance will result in increased backlog and need for rehabs and reconstruction down the road. (ii) Given the funding gap the focus should on (a) keep the good roads good (i.e., preservation first); (b) minimize transport costs by ensuring smooth roads. (iii) The governments develop “Marshall Plans” to revive the failed roads; and (iv) Need to look for alternative sources for road maintenance funds due to change of vehicle technology.

## ACKNOWLEDGEMENT

The consultant extends his sincere appreciation to the Tanzania Roads Association (TARA) and its staff for organizing of this training course and seminar. I am very grateful for TARA’s staff for their role in all logistical issues, and as secretariat in running the course. Special thanks are extended to the co-resource persons who played a key role in making this seminar and course successful – these include Eng. Ephathar Mlavi of TANROADS, Eng. Donati Deodati of TARURA, Eng. Sophie Tekie and Eng. Fergusson Paulse, both from the Namibia Roads Authority.

## REFERENCE

Mrawira, D. and B. Wlaschin. A Framework for Standardization of Transportation Asset Management. Article presented at the 88th Annual Meeting of the Transportation Research Board, Washington, DC. January 10-15, 2009.

## APPENDICES

---

## **APPENDIX A: Course and Seminar Attendance Register**



# REGIONAL SEMINAR AND COURSE ON ROAD ASSET MANAGEMENT FOR SENIOR EXECUTIVES AND DECISION MAKERS

## ARUSHA INTERNATIONAL CONFERENCE CENTRE (AICC) ARUSHA, TANZANIA 7<sup>TH</sup> - 12<sup>TH</sup> JUNE 2021

| SN | Full NAME                              | POSITION/JOB TITLE                                    | ORGANISATION                                       | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 | Day 6 | Total |
|----|--|---|--|-------|-------|-------|-------|-------|-------|-------|
| 1  | Prof. Ângelo António Macuácu           | Chief Executive Officer                               | Roads Fund, Mozambique                             | ✓     | ✓     | ✓     | ✓     | ✓     | ✓     | 6     |
| 2  | Eng. Agnes Pedro Siteo                 | Technician Engineer                                   | Roads Fund, Mozambique                             | ✓     | ✓     | ✓     | ✓     | ✓     | ✗     | 5     |
| 3  | Mr. António Raimundo Chitsotso         | Technician Architect                                  | Roads Fund, Mozambique                             | ✓     | ✓     | ✓     | ✓     | ✓     | ✗     | 5     |
| 4  | Mrs. Sandra Marina Estevão Mondjane Ho | Executive Secretary                                   | Roads Fund, Mozambique                             | ✓     | ✓     | ✓     | ✓     | ✓     | ✓     | 6     |
| 5  | Dr. Américo Ocua Dimande               | General Director                                      | National Roads Administration (ANE), Mozambique    | ✓     | ✓     | ✓     | ✓     | ✓     | ✓     | 6     |
| 6  | Mr. Luis Fernandes                     | World Bank Coordinator                                | National Roads Administration (ANE), Mozambique    | ✓     | ✓     | ✓     | ✓     | ✓     | ✗     | 5     |
| 7  | Mrs. Rubina Normahomed                 | ANE Delegate in Maputo Province                       | National Roads Administration (ANE), Mozambique    | ✓     | ✓     | ✓     | ✓     | ✓     | ✗     | 5     |
| 8  | Mr. John Ali Ipinge                    | Chief Executive Officer and President of ARMFA        | Roads Fund Administration Namibia                  | ✗     | ✗     | ✗     | ✗     | ✗     | ✗     |       |
| 9  | Mr. Elton Khoitaga !Gaoseb             | Senior Engineer                                       | Roads Fund Administration Namibia                  | ✓     | ✓     | ✗     | ✓     | ✓     | ✗     | 4     |
| 10 | Eng. Rose Wanjiru Ng'ang'a             | Manager, Technical Compliance                         | Kenya Roads Board                                  | ✓     | ✓     | ✓     | ✓     | ✓     | ✓     | 6     |
| 11 | Eng. Victor Odiwuor Odula              | Manager, Planning and Programming                     | Kenya Roads Board                                  | ✓     | ✓     | ✓     | ✓     | ✓     | ✓     | 6     |
| 12 | CPA Christopher Mugoh                  | Manager, Finance                                      | Kenya Roads Board                                  | ✓     | ✓     | ✓     | ✓     | ✓     | ✓     | 6     |
| 13 | Mr. Boniface D. Satu                   | Manager   | National Road Fund Office, Liberia                 | ✓     | ✓     | ✓     | ✓     | ✓     | ✓     | 6     |
| 14 | Mr. Prince Alphonso Nimrod             | Program Officer                                       | National Road Fund Office, Liberia                 | ✓     | ✓     | ✓     | ✓     | ✓     | ✓     | 6     |
| 15 | Mr. Hippolyte Mboua Minkeng            | Executive of Finance and Administration Department    | Road Fund Cameroon                                 | ✓     | ✓     | ✓     | ✓     | ✓     | ✗     | 5     |
| 16 | Mr. Armand Eloundou                    | Executive of Operations Control Department            | Road Fund Cameroon                                 | ✓     | ✓     | ✓     | ✓     | ✓     | ✗     | 5     |
| 17 | Mr. Herve Patrick Messi                | Senior Engineer                                       | Road Fund Cameroon                                 | ✓     | ✓     | ✓     | ✓     | ✓     | ✗     | 5     |
| 18 | Mrs. Line Marion DJADIO NONO           | Jurist  | Road Fund Cameroon                                 | ✓     | ✓     | ✓     | ✓     | ✓     | ✗     | 5     |
| 19 | Mr. Bashirr Sheriff                    | Deputy - Chief Executive Officer                      | Road Maintenance Fund Administration               | ✓     | ✓     | ✓     | ✓     | ✓     | ✓     | 6     |
| 20 | ING. Frederick Raymond Bruce           | Board Director  | Road Maintenance Fund Administration               | ✓     | ✓     | ✓     | ✓     | ✓     | ✓     | 6     |
| 21 | Dr. Emmanuel Michael Fungo             | Lecturer  | College of Engineering and Technology, Univ of DSM | ✓     | ✓     | ✓     | ✓     | ✓     | ✓     | 6     |
| 22 | Eng. Julius Charles Werongo            | Engineer  | UWP Consulting Limited                             | ✓     | ✓     | ✓     | ✓     | ✓     | ✗     | 5     |
| 23 | Dr. Prosper S. Nyaki                   | Head of Regional Centre for Excellence in Road Safety | National Institute of Transport (NIT)              | ✓     | ✓     | ✓     | ✓     | ✓     | ✗     | 5     |
| 24 | Eng. Peter John Sikalumba              | Acting Assistant Director Regional Roads              | Ministry of Works & Transport (Works)              | ✓     | ✓     | ✓     | ✓     | ✓     | ✓     | 6     |
| 25 | Eng. Hashimu I. Kabanda                | Acting Assistant Director urban Roads                 | Ministry of Works & Transport (Works)              | ✓     | ✓     | ✓     | ✓     | ✓     | ✗     | 5     |
| 26 | Eng. Herieli Ombaeli Samweli           | Civil Engineer  | Ministry of Works & Transport (Works)              | ✓     | ✓     | ✓     | ✓     | ✓     | ✓     | 6     |
| 27 | Eng. Liberatha Rujweka Alphonse        | Civil Engineer  | Ministry of Works & Transport (Works)              | ✓     | ✓     | ✓     | ✓     | ✓     | ✓     | 6     |
| 28 | Eng. Methew Msafiri                    | Engineer II/Urban Roads                               | Ministry of Works & Transport (Works)              | ✗     | ✗     | ✗     | ✗     | ✗     | ✗     |       |
| 29 | Eng. Silvester Thomson Haonga          | Manager, TanT2 Centre                                 | Ministry of Works & Transport (Works)              | ✓     | ✓     | ✓     | ✓     | ✓     | ✓     | 6     |
| 30 | Eng. Dorothy Liberatus Mtenga          | Projects Manager                                      | Tanzania National Roads Agency (TANROADS)          | ✓     | ✓     | ✓     | ✓     | ✓     | ✓     | 6     |
| 31 | Eng. Mussa O. Mataka                   | Manager, CML  | Tanzania National Roads Agency (TANROADS)          | ✗     | ✗     | ✗     | ✗     | ✗     | ✗     |       |
| 32 | Mr. Majaliwa Emmanuel Mkinga           | ICT Manager   | Tanzania National Roads Agency (TANROADS)          | ✓     | ✓     | ✓     | ✓     | ✓     | ✓     | 6     |
| 33 | Eng. Ndaji Simon Mayige                | Engineer  | Tanzania National Roads Agency (TANROADS)          | ✓     | ✓     | ✓     | ✓     | ✓     | ✗     | 5     |
| 34 | Eng. Johnny D.E. Kalupale              | Regional Manager                                      | Tanzania National Roads Agency (TANROADS)          | ✓     | ✓     | ✓     | ✓     | ✓     | ✓     | 6     |
| 35 | Eng. Elisony E. Mweladzi               | Head of Planning TANROADS Dar es Salaam               | Tanzania National Roads Agency (TANROADS)          | ✓     | ✓     | ✓     | ✓     | ✓     | ✓     | 6     |
| 36 | Eng. Saxtus J. Mutakubwa               | Engineer  | Tanzania National Roads Agency (TANROADS)          | ✓     | ✓     | ✓     | ✓     | ✓     | ✗     | 5     |
| 37 | Gladson Y Nikundiwe                    | Head of Maintenance                                   | Tanzania National Roads Agency (TANROADS)          | ✓     | ✓     | ✓     | ✓     | ✓     | ✓     | 6     |
| 38 | Eng. Motta R. Kyando                   | Acting Regional Manager TANROADS Kilimanjaro          | Tanzania National Roads Agency (TANROADS)          | ✓     | ✓     | ✓     | ✓     | ✓     | ✓     | 6     |
| 39 | Eng. Ephatar L. Mlavi                  | Regional Manager - Lindi                              | Tanzania National Roads Agency (TANROADS)          | ✓     | ✓     | ✓     | ✗     | ✗     | ✓     | 4     |
| 40 | Bashiri R. Rwesingisa                  | Regional Manager                                      | Tanzania National Roads Agency (TANROADS)          | ✓     | ✓     | ✓     | ✓     | ✓     | ✗     | 5     |
| 41 | Given H. Njiro                         |   | 0 Tanzania National Roads Agency (TANROADS)        | ✗     | ✗     | ✗     | ✗     | ✗     | ✗     |       |
| 42 | Msama K. Msama                         |   | 0 Tanzania National Roads Agency (TANROADS)        | ✓     | ✓     | ✓     | ✓     | ✓     | ✗     | 5     |
| 43 | Eng. Erick C. Ng'walali                | Acting Head of Planning                               | Tanzania National Roads Agency (TANROADS)          | ✓     | ✓     | ✓     | ✓     | ✓     | ✗     | 5     |

|    |                                 |   |  |    |    |    |    |    |    |    |
|----|---------------------------------|---|--|----|----|----|----|----|----|----|
| 44 | Eng. Yussuph R. Pogwa           | In-Charge of Planning Unit  | Tanzania National Roads Agency (TANROADS)      | ✓  | ✓  | ✓  | ✓  | ✓  | ✗  | 5  |
| 45 | Eng. Justin Mathew Lyatuu       | Planning Manager  | Tanzania Rural and Urban Roads Agency (TARURA) | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | 6  |
| 46 | Eng. Venant Thadey Komba        | Principal Engineer (Planning)   | Tanzania Rural and Urban Roads Agency (TARURA) | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | 6  |
| 47 | Eng. Nicholas Dominic Francis   | Regional Coordinator, Kilimanjaro   | Tanzania Rural and Urban Roads Agency (TARURA) | ✓  | ✓  | ✓  | ✓  | ✓  | ✗  | 5  |
| 48 | Eng. Deodati Kaishe Donati      | Senior Planning Engineer  | Tanzania Rural and Urban Roads Agency (TARURA) | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | 6  |
| 49 | Eng Hamidu W Mataka             | Maintanance Manager   | Tanzania Rural and Urban Roads Agency (TARURA) | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | 6  |
| 50 | Eng Balthazar B Faustine        | Road Enineer  | Tanzania Rural and Urban Roads Agency (TARURA) | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | 6  |
| 51 | Eng Goodluck S Mbanga           | Council Manager   | Tanzania Rural and Urban Roads Agency (TARURA) | ✓  | ✓  | ✓  | ✓  | ✓  | ✗  | 5  |
| 52 | Eng Geofrey P Mkinga            | Regional Coordinator  | Tanzania Rural and Urban Roads Agency (TARURA) | ✓  | ✓  | ✓  | ✓  | ✓  | ✗  | 5  |
| 53 | Eng Rashid K Mtamila            | WBW   | Tanzania Rural and Urban Roads Agency (TARURA) | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | 6  |
| 54 | Eng Edward A Amboka             | Regional Coordinator  | Tanzania Rural and Urban Roads Agency (TARURA) | ✓  | ✓  | ✗  | ✗  | ✗  | ✗  | 2  |
| 55 | Eng. Rashid Sellemani Kalimbaga | Deputy Manager, Technical Services  | Roads Fund Board, Tanzania                     | ✓  | ✓  | ✓  | ✓  | ✓  | ✗  | 5  |
| 56 | Mr. Emmanuel Mwakajinga         | Head - ICT Unit   | Roads Fund Board, Tanzania                     | ✓  | ✓  | ✓  | ✓  | ✓  | ✗  | 5  |
| 57 | Mr. Prosper Fivawo              | Principal Economist   | Roads Fund Board, Tanzania                     | ✓  | ✓  | ✓  | ✓  | ✓  | ✗  | 5  |
| 58 | Mr. Abdallah Mtey               | Head Procurement Management Unit  | Roads Fund Board, Tanzania                     | ✓  | ✓  | ✗  | ✓  | ✓  | ✓  | 5  |
| 59 | Eng. Jacob D. Mukasa            | Principal Engineer  | Roads Fund Board, Tanzania                     | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | 6  |
| 60 | Mr. Godlove Stephen             | Deputy Manager, Resource Mobilisation   | Roads Fund Board, Tanzania                     | ✓  | ✗  | ✗  | ✗  | ✗  | ✓  | 2  |
| 61 | CPA John R. Aswile              | Deputy Manager, Finance & Administration  | Roads Fund Board, Tanzania                     | ✓  | ✓  | ✓  | ✓  | ✓  | ✗  | 5  |
| 62 | Mr. Eliud T. Nyauhenga          | Roads Fund Manager  | Roads Fund Board, Tanzania                     | ✗  | ✗  | ✗  | ✓  | ✓  | ✗  | 2  |
| 63 | Mr. Joseph Odo Haule            | Road Fund Board Chairman  | Roads Fund Board, Tanzania                     | ✓  | ✓  | ✓  | ✓  | ✓  | ✗  | 5  |
| 64 | Eng. Joseph K. Malongo          | Road Fund Board Member & Permanent Secretary, Ministry of Works & Transport                         | Roads Fund Board, Tanzania                     | ✗  | ✗  | ✓  | ✗  | ✗  | ✗  | 1  |
| 65 | Prof. Riziki Silas Shemdoo      | Roads Fund Board Member, Permanent Secretary, President's Office Regional Admn. & Local Governments | Roads Fund Board, Tanzania                     | ✗  | ✗  | ✗  | ✓  | ✓  | ✓  | 3  |
| 66 | Eng. Gilbert G Mwoga            | Roads Fund Board Member & Director of Infrastructure Development, PO-RALG                           | Roads Fund Board, Tanzania                     | ✗  | ✓  | ✓  | ✓  | ✓  | ✓  | 5  |
| 67 | Mr. Meshack Anyingisye          | Roads Fund Board Member   | Roads Fund Board, Tanzania                     | ✗  | ✗  | ✗  | ✗  | ✗  | ✗  |    |
| 68 | Mr. Octavian E.N Mshiu          | Roads Fund Board Member   | Roads Fund Board, Tanzania                     | ✗  | ✗  | ✓  | ✓  | ✓  | ✓  | 4  |
| 69 | Mr. Hussein Wandwi              | Roads Fund Board Member   | Roads Fund Board, Tanzania                     | ✓  | ✓  | ✓  | ✓  | ✓  | ✗  | 5  |
| 70 | Mr. William Mwakilema           | Roads Fund Board Member   | Roads Fund Board, Tanzania                     | ✗  | ✗  | ✗  | ✗  | ✗  | ✗  |    |
| 71 | Eng. Rogatus H. Mativila        | Roads Fund Board Member & Director of Roads, Ministry of Works and Transport                        | Roads Fund Board, Tanzania                     | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | 6  |
| 72 | Dr. Vitalis Agati Ndume         | Senior Lecturer, DIT & RMMS Consultant to TANROADS  | Dar es Salaam Institute of Technology (DIT)    | ✓  | ✓  | ✓  | ✓  | ✓  | ✗  | 5  |
| 73 | Prof. Donath Mrawira            | Lead Resource Person for the Course & Seminar   | 4M Global Inc. Canada                          | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | 6  |
| 74 | Eng. Severin Materu             | Member, Organising Committee  | Tanzania Roads Association (TARA)              | ✗  | ✓  | ✓  | ✓  | ✓  | ✓  | 5  |
| 75 | Eng. Swaleh Kassera             | Member, Organising Committee  | Tanzania Roads Association (TARA)              | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | 6  |
| 76 | Mr. Elifadhili Mgonja           | Member, Organising Committee  | Tanzania Roads Association (TARA)              | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | 6  |
| 77 | Ms Elizabeth Serf Chingalame    | Member, Organising Committee  | Tanzania Roads Association (TARA)              | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | 6  |
| 78 | Ms Mwanaisha Ally Mhalule       | Member, Organising Committee  | Tanzania Roads Association (TARA)              | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | 6  |
| 79 | Mr. Daudi Kitomo                | Member, Organising Committee  | Tanzania Roads Association (TARA)              | ✓  | ✗  | ✗  | ✓  | ✓  | ✗  | 3  |
| 80 | Eng. Hagai Kuendeka Bishanga    | Member, Organising Committee  | Tanzania Roads Association (TARA)              | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | 6  |
| 81 | Dr. Christina Kayoza            | Member, Organising Committee  | Tanzania Roads Association (TARA)              | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | 6  |
| 82 | Eng. Laurent Athanas            | Member, Organising Committee  | Tanzania Roads Association (TARA)              | ✓  | ✓  | ✓  | ✓  | ✓  | ✓  | 6  |
| 83 | Eng. Victor Hadson Seff         | Chief Executive Officer   | Tanzania Rural and Urban Roads Agency (TARURA) | ✗  | ✗  | ✗  | ✗  | ✗  | ✓  | 1  |
| 84 | Mr. Rashid Mohamed              | Chief Executive Officer   | Kenya Roads Board                              | ✗  | ✗  | ✗  | ✗  | ✗  | ✓  | 1  |
|    |                                 |   |  | 70 | 70 | 69 | 72 | 72 | 44 | 67 |

## APPENDIX B: Participants Comments on 4th Day of RAMS Training Course

**TABLE B1. Comments on 4<sup>th</sup> Day of Course: (1) write 3 most important lessons you learnt in yesterday's lecture; and (2) What steps will you take at a personal level at your work in response to what you have learnt?**

**TABLE B1. Comments on Day No. 4 of Course: (1) Three most important lessons you have learnt in the training Course**

- Implementation of Asset Management System (AMS) is about changing organization culture and it need to start from Top to Bottom.it is an important and mandatory tool in managing Civil Infrastructure assets for a comprehensive and long-term purposes.
- People should have ownership of Assets on the organization. Road Asset Management is the responsibility of any manager. Also the use of Asset Management Techniques.
- The most important management basic component is "PEOPLE". For sustainability, it is important for the country to own the Management System. Everyone in the Agency/organization is an Asset Manager, therefore training/knowledge sharing is important in order to achieve organizational goals.
- Maturity level in implementation of Asset Management by ISO 55000.Organizations needs to gauge themselves and strike to achieve high levels.
- The management of financial resources at Road Fund must be continuously process that means it is not only to be business issue of Road Agencies/Authorities but also of Road Fund.
- Postponing the maintenance of Roads kills the economy, as if you don't do proper maintenance at the right time, the value of money reduced. Therefore, maintenance of Roads must be given the priority as it prolongs the life span of an Asset. We have to keep right type of maintenances at right time, right treatment at right time. Inventory and roads condition database and related analytics are not by themselves sufficient to be RAMS.
- There is wide variation in the establishment and operation of Road Fund Boards across Africa.
- It is very important to measure what you manage for improvement purpose. Audit is not a performance measure as performance measures have to give directions.
- Improve accountability to user.
- The framework of Roads Asset Management is very important and going forward.
- Emphasize has always been on the life cycle activities, however Asset Management requires that all other element starting from policy and strategic direction to Asset Management information has to get the same emphasis.
- When dealing with Roads Asset Management, Organization should seize the work and engage to unmake it inclusive across various Institutions, Government and Organization.
- I have learnt to locate few resources we have.
- We should have our own way of doing things and not being imposed by foreigners. Simply because most system (RAMS) from foreigners are not suitable.
- I have learnt that Asset Management enhance decision making with more and explicitly Investment science.
- The concept of preserve what you have, before put in new Asset, to maximize values (keep the good roads good)
- Maximization of the Asset value occur at the planning stage out of the six blocks we have learnt.

**TABLE B1. Comments on Day No. 4 of Course: (1) Three most important lessons you have learnt in the training Course**

- Change the people understand (culture) in the organization is key to maximize Asset Value.
- Having data, analysis with capable manpower. Skilled people are very important.
- RAMS ensures pass ability of Roads Networks throughout the year.
- RAMS facilitates social economic welfare of roads user and economic growth.
- Delayed interaction on good constructed Asset will lead to invest massively on the same Asset to restore it to its original shape.
- It's very important to scope the work before its implementation.
- Strategic, Planning, monitoring, feedback is very important during road works.
- Road Asset Management is the foundation for better and optimal planning, implementation and management of roads development and maintenance.
- Maintenance Fund should be used for maintenance and not for construction. Roads should be treated early before to poor condition.
- HDM-4 and GIS are not Road Asset Management tools. These are analytical tools that help an engineer to come up with proper decision making.
- The concept of Asset Management and six (6) steps that guide the implementation of good practices in Asset Management System, such as policy and strategic organization, planning and data collection, continuous monitoring for the quality of the asset management.
- Management of data using GIS, GPS tools and the importance of having database.
- Training to people in power on importance of Roads Maintenance is vital for proper RAM practice. Effective investment is needed.
- General situation of roads in many African countries needs marshal plan to avoid eventual collapse.
- Performance Based Management is more important on Roads Asset Management that Annual Budget Management because the formal one is most cost effective.
- Key considerations for implementing Asset Management System in an organization/agency which are grouped and sequenced as follows; PEOPLE-BUSSINESS PROCESS-THE TECHNOLOGY.
- Six (6) blocks of Asset Management especially block 2 (Resource allocation) and block 5 (Monitoring and Evaluation).
- Block 6 of Asset Management – information management
  - Importance of Data Base.
  - Different user.
  - Updating of Data Base and it's important to different users such as managers, researchers and technology expert.
- Need for reliable and structured data collection for optimization of work programs against the limited resources.
- Capacity Building on RMS and any integrated analytics to promote its application.
- Scientific Asset valuation to help in bringing at the need to preserve this Asset. This should also show the replacement value.
- The role of Roads Fund to supervise Road Agency in the establishment of Road Asset Management unit.
- Asset Management increase efficient in public expenditure and demand for services.
- I have learnt about changing mind-set of people within the organization that anticipate what we have and what we needed.

**TABLE B1. Comments on Day No. 4 of Course: (1) Three most important lessons you have learnt in the training Course**

- Having the right technology can save cost when Development a RAMS.
- Simple as elaborated colour coded is a good means of communication between Executives and politicians.
- Knowledge shared through seminars helps a lot.
- We need to preserve what we have before going to someone new.
- We need to think of impacts that will occur to citizens due to our management of roads.
- RAMS can be useful tool for determining optimal use of available maintenances funding in transparent manner and determining optimal budget level for repair and maintenance of the existing Roads Network. Consideration in development the system
  - Immediate outputs
  - Long-term outputs
  - Ability to audit the system.
- Importance of awareness to politicians that Roads Fund money are not for development works, there is need to associate other funds for development and leave Roads Fund money for maintenance for better Roads Asset Management.
- Asset Management is the key for development continuity in any aspect.

**TABLE B2. Comments on the 4<sup>th</sup> of the Course: What steps will you take at a personal level at your work in response to what you have learnt from the RAMS Course?**

**TABLE B2. What steps will you take at a personal level at your work in response to what you have learnt from the RAMS Course?**

- Preparation of report to the office explaining the importance of Roads Asset Management System (RAMS) as well as improving RAM practices.
- Requesting for a chance to make a presentation at a top management meeting and the Board on RAM, showing the PROS and CONS of the approach we are going with so that I convince them to Change the organization focus on RAM and to remind them that they are also roads assets manager.
- As a Consultant all roads that we supervise during construction are handed over to the employer upon issuance of certificate of completion. More sensitization would be done to prepare the Employer to allocate maintenance funds of all new roads. It usually takes the Employer a lot of time to even allocate funds for cleaning new roads and desilting drains. By educating the Employer the cost implication of timely maintenance then the rapid deterioration of new roads can be prevented and thus preserve all new roads.
- Propose capacity building workshop on HDM-4 for roads sector engineers to improve knowledge in economic analysis.
- To convince politicians to make a policy about using Roads Funds money for maintenance works only and other sources of funds for rehabilitations and development works.
- To conduct clear assessments of paved roads to know its actual condition and age.
- To emphasize on establishment of Roads Assessment Management Units and budget of facilitating the activities of RAM.

**TABLE B2. What steps will you take at a personal level at your work in response to what you have learnt from the RAMS Course?**

- To identify the resources, learn to carry out the implementations and ensure the scope and action plan is owned by management.
  - Design a good communication strategy with in agencies and train more the management team.
  - Propose a meeting between Roads Fund Boards and Roads Agencies in discussing the best way to manage Roads Assets, preferably advising them on the best technical tools to be used when implementing the Roads Asset Management System.
  - To ensure that TARURA utilize DROMAS in planning and resource allocation.
  - To ensure TARURA Personnel own the management system.
-

## APPENDIX C: PART I of the Post-Course Questionnaire – Comments of the Participants Module by Module

|            |  |
|------------|--|
| Module 1.1 | <ul style="list-style-type: none"> <li>• Our agencies and road authorities have to copy.</li> <li>• Good and very insightful.</li> <li>• Guest of honour could arrive on time so that the program starts as scheduled.</li> <li>• Guest of honour to be with field oriented nature.</li> <li>• I think next time all delegates should introduce themselves individually.</li> <li>• Improve opening ceremony arrangement.</li> <li>• Involvement of top leaders is very important, i.e., Ministers.</li> <li>• It was precise and punctuality well observed.</li> <li>• Not properly coordinated.</li> <li>• Self-introduction for each participants was required.</li> <li>• The direction was well organized.</li> <li>• This area was addressed very well.</li> <li>• Very well explained the objectives of the worse and clean example of TARURA, TANROADS &amp; NAMIBIA.</li> <li>• Very warm welcome, the introduction gave us energy to continue the course.</li> <li>• Was expecting self-introduction to know ourselves.</li> <li>• We were very well welcomed and our expectation was high.</li> </ul>   |
| Module 1.2 | <ul style="list-style-type: none"> <li>• Current practice well presented, a demonstration on real life would be very productive.</li> <li>• Each agency showed on how asset management is practiced.</li> <li>• Good presentation, but some important information and details left out.</li> <li>• Increase awareness to politician actions on road fund</li> <li>• It is going to be very useful in my organization (TANROADS) than before.</li> <li>• It is very inspiring.</li> <li>• More awareness should be enhanced to decision makers and stakeholders.</li> <li>• TANROADS is in a good/ competent level need to prepare for application of ISO 55000 certification, TARURA needs do a lot as trained.</li> <li>• TARURA; No long-term planning/module. TANROADS; Still use multi-criteria analysis to prepare plans budgets. RFB; No long-term planning and weak maintenance.</li> <li>• The agencies should start where they are and continue to the high level (i.e., certified by ISO 55000) to gain reputation.</li> <li>• The Tanzanian Road Agencies are doing fine.</li> <li>• There is no need to have only 1 system. There is a need to improve the TARURA system and framework RFB.</li> </ul> |
| Module 2   | <ul style="list-style-type: none"> <li>• Before 100% application will have to mix with normal practice.</li> <li>• Excellent, eye opener.</li> <li>• Framework on 2th and 4th are key to AM.</li> <li>• Good</li> <li>• Good presentation.</li> <li>• Implementation of RAMS is about changing the culture / changing mind-set, identifying weakness on long-term tactical planning and performance, measure, monitoring and feedback.</li> <li>• Presentation were very clear and informative.</li> <li>• The need to have a real life example to demonstrate.</li> </ul>   |

|          |   |
|----------|---|
|          | <ul style="list-style-type: none"> <li>• The principle of Road Asset Management, very well explained.</li> <li>• The Professor killed it. I was blown away by the presentation.</li> <li>• This was very good and interesting, I learnt the real value of asset management.</li> <li>• Very well delivered during the lecture, recap conclusion session.</li> </ul>   |
| Module 3 | <ul style="list-style-type: none"> <li>• Before 100% application will have to mix with normal practice.</li> <li>• Excellent, eye opener.</li> <li>• Framework on 2th and 4th are key to AM.</li> <li>• Good.</li> <li>• Good presentation.</li> <li>• Implementation of RAMS is about changing the culture / changing mind-set, identifying weakness on long-term tactical planning and performance, measure, monitoring and feedback.</li> <li>• Presentation were very clear and informative.</li> <li>• The need to have a real life example to demonstrate.</li> <li>• The principle of Road Asset Management, very well explained.</li> <li>• The Professor killed it. I was blown away by the presentation.</li> <li>• This was very good and interesting, I learnt the real value of asset management.</li> <li>• Very well delivery during the lecture, recap conclusion session.</li> </ul> |
| Module 4 | <ul style="list-style-type: none"> <li>• Excellent but comparison could have been helpful.</li> <li>• Excellent.</li> <li>• In Tanzania (TANROADS) it is actually done better.</li> <li>• More details needed to appreciate the best practices.</li> <li>• The concept of slowing down the rate of asset deterioration and effectively increasing the useful life of the asset was well narrated.</li> <li>• The time was not enough.</li> <li>• Time, Change of mind-set and Cost effectiveness.</li> <li>• Well presented.</li> <li>• Well understood.</li> </ul>   |
| Module 5 | <ul style="list-style-type: none"> <li>• Excellent but comparison could have been helpful.</li> <li>• Excellent.</li> <li>• In Tanzania (TANROADS) it is actually done better.</li> <li>• More details needed to appreciate the best practices.</li> <li>• The concept of slowing down the rate of asset deterioration and effectively increasing the useful life of the asset was well narrated.</li> <li>• The time was not enough</li> <li>• Time, Change of mind-set and Cost effectiveness.</li> <li>• Well presented.</li> <li>• Well understood.</li> </ul>  |
| Module 6 | <ul style="list-style-type: none"> <li>• After this course that will be Implementation effectively.</li> <li>• Good comprises of almost everything, I know.</li> <li>• Need to understand the concept, Change the mind-set.</li> <li>• Well presented.</li> </ul>   |
| Module 7 | <ul style="list-style-type: none"> <li>• Good but still facing some challenges in terms of political decisions.</li> <li>• Great.</li> <li>• More examples needed.</li> </ul>   |



|           |   |
|-----------|---|
|           | <ul style="list-style-type: none"> <li>• This was perfect done and understood by the participants.</li> <li>• This will help us to save money and time.</li> <li>• Very good for developing countries, however, implementation is challenging.</li> <li>• Very good section, the authorities must understand the condition of the Road Network after some year applying certain amount of money.</li> <li>• Well connected and understood.</li> <li>• Well-presented but time was not enough.</li> </ul>  |
| Module 8  | <ul style="list-style-type: none"> <li>• Good.</li> <li>• Great.</li> <li>• More time needed for practice.</li> <li>• Need to practice for the participant</li> <li>• Require sufficient time.</li> <li>• Should take in political situation.</li> <li>• The tools need to be shared to participants so that actually practice it and implement on several projects.</li> <li>• This was done well.</li> <li>• Too technical.</li> <li>• Use more cases relating to Roads Subsectors.</li> <li>• We need to advocate and win politician votes in the aspect.</li> </ul>   |
| Module 9  | <ul style="list-style-type: none"> <li>• By measuring, I would be able to manage and monitor to see if I obtain the pretended results.</li> <li>• Good.</li> <li>• Practical example should be shared with the participants. May be good examples from countries with mature AMS.</li> <li>• The idea of distinguishing between performance measure and Auditing was very clear.</li> <li>• This will lead to better output as it will be continuous.</li> <li>• Very important because IT gives the feedback of all implementation process and allow for amendments on the process.</li> <li>• Well elaborated.</li> </ul>   |
| Module 10 | <ul style="list-style-type: none"> <li>• Good</li> <li>• Important tools to maintain the Road Assets.</li> <li>• More time needed for practice.</li> <li>• This will require further breakdown for understand.</li> <li>• Well explained and demonstrated.</li> <li>• Well explained and demonstrated.</li> <li>• Well-presented but time was not enough.</li> </ul>  |
| Module 11 | <ul style="list-style-type: none"> <li>• For the future course the participants should be given time to do an example on their own especially on Linear Programming and Optimization.</li> <li>• Helps make results and better decisions.</li> <li>• It was a shame that a student didn't have the opportunity of doing an exercise on this.</li> <li>• Need to practice for the participant</li> <li>• Nice though not appropriate for seminar Executive and decision makers.</li> <li>• Not enough.</li> <li>• Not well structured.</li> <li>• The excel used as example should be shared with the participants.</li> <li>• This is essential for a successful implementation of the whole Asset Management.</li> </ul> |

|           |   |
|-----------|---|
|           | <ul style="list-style-type: none"> <li>• This was not done, may be set aside one day.</li> </ul>  |
| Module 12 | <ul style="list-style-type: none"> <li>• Good and well preserved.</li> <li>• Summary was very comprehensive covering all key concept from all module.</li> <li>• Very clarifying conclusion. Very brave and capture all lessons of the course.</li> <li>• Was educative, the presenter was on track.</li> <li>• Well summarized and understood.</li> <li>• Well summarized.</li> <li>• Will done since covers almost everything.</li> </ul> |
| Module 13 | <ul style="list-style-type: none"> <li>• Job done, keep it up.</li> <li>• Job done, keep it up.</li> <li>• The course was very fruitful.</li> <li>• This is fine and should be repeated.</li> <li>• Well done and summarized the entire concept of RAMS.</li> <li>• Well organized.</li> </ul>  |
| Module 14 | <ul style="list-style-type: none"> <li>• Good.</li> <li>• Presenter is up to date and understanding the content.</li> <li>• The resource was very well done insightful.</li> <li>• Well done, Excellent.</li> <li>• Well organized.</li> </ul>  |

## **APPENDIX D: PART II of the Post-Course Questionnaire. Participants Comments on the Overall Impression of the Seminar & Course**

**TABLE D1. Comments on the Most Valuable Aspects of the Course**

| QN1. What do you view as the most valuable aspect of the training?   |
|--|
| <ul style="list-style-type: none"> <li>➤ 1. AM framework to manage Road Assets. 2. The importance of preservation of National assets.</li> <li>➤ 1. Importance of Asset Management. 2. How to manage Assets. 3. Priority in management of assets. 4. Impacts of Asset Management. All modules were relevant therefore valuable in relation to the course.</li> <li>➤ AM implementation.</li> <li>➤ Asset management as the valuable business to be conducted/done by every people within organization.</li> <li>➤ Could be improved.</li> <li>➤ Elaborate presentation.</li> <li>➤ Exchange on how institutions in different countries are managing the roads assets.</li> <li>➤ Expert was so knowledgeable in the area of Road Asset Management.</li> <li>➤ Exposed trainees the best practices and ways of managing road assets.</li> <li>➤ Framework and principles of Road Asset Management, the importance of each blocks, critical importance of planning block.</li> <li>➤ Having a single topic.</li> <li>➤ Idea of developing Africa's Infrastructure without false criteria used by developed brother countries e.g. Environmental issues/ world heritage etc. Typical example being implementation of Julius Nyerere Hydropower Project in Tanzania.</li> <li>➤ Information Management - Data Base.</li> <li>➤ Module #6</li> <li>➤ New elements, e.g., the use of ISO 55000.</li> <li>➤ Preserve the Roads first.</li> <li>➤ RAM framework, Planning, Prioritization and Budgeting analysis.</li> <li>➤ Refresh ideas on Roads Management.</li> <li>➤ Refresh ideas on Roads Management.</li> <li>➤ Sharing of experience in RAMS through discussion.</li> <li>➤ Sharing of experience in RAMS.</li> <li>➤ Strategic planning.</li> <li>➤ Sustainable RAM.</li> <li>➤ The AM framework comprising all 6 blocks.</li> <li>➤ The exchanging of experience between Road Agencies and Road Authorities.</li> <li>➤ The experience of the Professor and the capacity to share it.</li> <li>➤ The framework and principles of Asset Management especially how to improve block 2 (long-term planning / Resources allocation) and block 5 (Monitoring and Evaluation).</li> <li>➤ The information that was shared is valuable.</li> <li>➤ The method of participating one by trainer and example which he gives to clarify his teaching.</li> <li>➤ The most is understanding on an understanding the role of Road Fund and Road Agencies on the management of Road Assets.</li> <li>➤ The most valuable aspect of the training is that it is directed for senior executive and decision makers who have good influence on the organizations.</li> <li>➤ The Namibian presentation.</li> <li>➤ The performance measure aspect and the whole monitoring and feedback aspects.</li> <li>➤ The whole concept of Road Asset Management System.</li> <li>➤ To utilize the small resources, we have by preserving the existing we have by using linear programming and strategic level across Asset Optimization.</li> </ul> |

**QN1. What do you view as the most valuable aspect of the training?**

- To utilize the small resources, we have by preserving the existing we have by using linear programming and strategic level across Asset Optimization.
- Understand the framework of RAM.
- Understand what Asset Management is and how important its implementation is in the country.
- Very important and well-arranged and managed.

**TABLE D2. Comments on the Least Valuable Aspects of the Training**

| QN2. What do you view as the least valuable aspect of the training?  |
|--|
| <ul style="list-style-type: none"> <li>➤ 1. The time seem to be limited to elaborate in details some important aspects in RAM. 2. Indicator need to use more simplified methods.</li> <li>➤ All modules were relevant therefore valuable in relation to the course.</li> <li>➤ Asset location GIS and GPS.</li> <li>➤ Demonstration of linear programming Equation.</li> <li>➤ It was not really designed for senior executive and decision makers. Too much to shallow for decision makers.</li> <li>➤ Linear planning, difficult to understand.</li> <li>➤ Minimal engagements. Breakaway sessions would have served to break the monotony of presentation.</li> <li>➤ Module #11</li> <li>➤ Next time they may add more presenters.</li> <li>➤ Some aspects were too technical for senior executive and decision makers.</li> <li>➤ The breakfast which was so shallow.</li> <li>➤ The catering &amp; the long hours should be revised. It's a long time Gathering information</li> <li>➤ The daily schedule was too long (up to 17:00) for senior executives who have other issue to attend.</li> <li>➤ The lack of breaks reduces the sharing experiences time.</li> <li>➤ The lack of breaks, break-out group, lack of group meetings, etc.</li> <li>➤ The overall topics of the training add additional value.</li> <li>➤ The use of system - different system of Asset Management.</li> <li>➤ The valuable aspect of the raining is understanding the e Asset Management through six blocks.</li> <li>➤ There is nothing that I knew as last valuable.</li> <li>➤ Too much references from western countries.</li> </ul> |

**TABLE D3. Comments on Possible Follow up Actions by Participants**

| QN3. What specific actions will you take as a result of this workshop?   |
|--|
| <ul style="list-style-type: none"> <li>➤ 1. Educate other staff. 2. Measure performance in our workplace.</li> <li>➤ 1. Knowledge transfer. 2. Improvement of AM TOOLS.</li> <li>➤ 1. Promote the cultural change on the need of preservation of asset management. 2. Inclusion of RAM on performance agreement.</li> <li>➤ Change my way on doing things with a take away that "you can't manage what you don't measure"</li> <li>➤ Change the mind-set of my colleagues.</li> <li>➤ Change the organisation culture to make use of technology system to achieve maximum efficiency.</li> <li>➤ Changing Organization culture such that my staff can effectively use mature business process and technology to achieve maximum efficiency.</li> <li>➤ Convincing the management to change the culture we have of thinking more on Roads Development than Maintenance.</li> <li>➤ Conscious application of the whole concept.</li> <li>➤ Creating my database.</li> <li>➤ Deliver the knowledge of RAMS to my institutions.</li> <li>➤ Do an effort to change the way my company deals with RAMS.</li> <li>➤ Enhance monitoring and importance of maintenance.</li> <li>➤ Ensure resources allocation are focused to preserve the asset value.</li> <li>➤ From the Road Fund will advise my institution to take active role during planning of road work maintenance with a view of having medium to long-term outputs.</li> <li>➤ High approach when planning for Asset Management.</li> <li>➤ I need to setup.</li> <li>➤ I will be the champion of RAM in my institution.</li> <li>➤ I will carry forward the best practice from the various organizations and the learning experience from the training such as framework, optimization and performance monitoring for effective RAMS.</li> <li>➤ I will personally try to import this good knowledge that I acquired to my fellow technocrats for us to have common understanding of RAM and perhaps we can jointly form a best system to manage asset.</li> <li>➤ I will share the knowledge gained with my co-workers.</li> <li>➤ Implement RAM for roads sector to have good management of roads or resources.</li> <li>➤ Implementation of RAMS.</li> <li>➤ Improve RAM practice in our working place.</li> <li>➤ Improve RAM practice in our working place.</li> <li>➤ Insist of Assets Management at my work place.</li> <li>➤ Lesson learnt and experience shared.</li> <li>➤ Need to include the RAMS teaching &amp; content in our curriculum.</li> <li>➤ Provision of asset management units.</li> <li>➤ Re-reading, studying and information shared and application</li> <li>➤ Share the knowledge in my workplace.</li> <li>➤ Start establishment of Data base, prioritize using "solver" for the next year budget, communicate to the managers for implementing RAMS.</li> <li>➤ Start establishment of Data base, prioritize using "solver" for the next year budget, communicate to the managers for implementing RAMS.</li> <li>➤ The general knowledge of RAM.</li> <li>➤ Timely maintenance of roads to prevent increase cost of maintenance.</li> <li>➤ To be awareness to others.</li> <li>➤ To conduct time assessment of road asset and its condition.</li> <li>➤ To improve the RAMS to improvement continuous stage.</li> <li>➤ To insist on the importance of Assets Management and make sure it is observed at our office.</li> </ul> |

- To practice Asset Management Strategically.
- To start improving skills on HDM4 and other software as a tools for asset management.
- Training of my subordinate on RAM
- Use of ISO 55000 to gauge performance of the organization and basic for improvement.
- Work toward ISO 55000 certification.

**TABLE D4. Comments on how the training has equipped Participants with new skills that can be used in daily activities in Your Agency**

| QN 4. Has the training equipped you with new skills that you can use in your daily activities in Your Agency?  |
|--|
| <ul style="list-style-type: none"> <li>➤ 1. Keep good roads in a good condition by applying right types of maintenance at the right time. 2. Improve the area of resource allocations. 3. Improve the area of monitoring and evaluation (feedback)</li> <li>➤ ANE: YES. the training opened our mind in view of the discipline of asset management.</li> <li>➤ Data collection and creating database (Updating).</li> <li>➤ KENYA ROADS BOARD: YES. I have understood that GIS and HDM4 are tools that assist in RAM.</li> <li>➤ MoWT: YES. Highly equipped with new skills.</li> <li>➤ Multiyear planning for Road Asset Management.</li> <li>➤ NIT: YES</li> <li>➤ Optimization using "Solver."</li> <li>➤ PORALG: Awareness of ISO 55000 Asset Management maturity levels.</li> <li>➤ RFB: Made me identify area of weakness. Need to ensure road agencies undertake objective prioritization of road works with a view of having medium and long-term results.</li> <li>➤ RFB: Our decision making will be based on all social and economic factors aimed at using roads asset assets as the catalyst for development, market security etc.</li> <li>➤ RFB: The six blocks are so vital to Assets Management.</li> <li>➤ RFB: They are very valuable and can be put in place to enable the agencies to work efficiently.</li> <li>➤ RFB: Understand the importance of RAMS.</li> <li>➤ RFB: YES.</li> <li>➤ RFB: YES. The whole of this requires the whole team to achieve the intended goals i.e. no gap, no breakdowns in progressing to output and outcome.</li> <li>➤ RMFA: YES. Need to change the mind-set from top to bottom to consider competent staff.</li> <li>➤ ROAD FUND MOZAMBIQUE: YES.</li> <li>➤ ROAD FUND MOZAMBIQUE: YES. I do. Our Road Fund doesn't have any asset management in progress. This will be new in the organization and this course has given all the information we need to start implementing one.</li> <li>➤ ROAD FUND MOZAMBIQUE: YES. it was good to be called into attention on how Asset Management implementation can be less costly, save time and improve mobility.</li> <li>➤ ROAD FUND NAMIBIA. It will give a further understanding on a topic.</li> <li>➤ TANROAD: YES. The 6 Strategic areas of asset management, importance of each area and importance of work properly in each area.</li> </ul> |

|  |
|--|
| ➤ TANROADS: YES  |
| ➤ TANROADS: YES.   |
| ➤ TANROADS: YES.   |
| ➤ TANROADS: YES.   |
| ➤ TANROADS: YES.   |
| ➤ TANROADS: YES.   |
| ➤ TARURA: YES  |
| ➤ TARURA: YES. Current we are using DROMAS in road management but still doesn't give results we need. We good approach on how to start.  |
| ➤ TARURA: YES. Optimization, Data updating based on monitoring, the importance of having RAM tools to decision making.   |
| ➤ TARURA: YES. We need to restructure how we collect road inventory and condition survey. Also we need to setup quality of data that are been collected.                                     |
| ➤ The skills will help on the improvement of DROMAS by improving some data.  |
| ➤ The training is an eye opener to managing Road Asset on its impact on allocation of resources.   |
| ➤ UDSM: YES  |
| ➤ YES  |
| ➤ YES  |
| ➤ YES. How to go about commencing a RAMS.  |
| ➤ YES. It has added knowledge on how system can stimulate Asset Management.  |
| ➤ YES. RFB: It has with the experience that we got from the course. I will be able to take better decision on asset management.  |
| ➤ YES. the train has been very useful and it will help me and my institution during budgeting and planning.  |
| ➤ YES. Use of ISO 55000 to measure the performance, asses level of maturity by using RAM framework.  |
| ➤ YES. Use of proper presentation to convince management and key stakeholders /decision makers ,for example colour code illustrations to explain effects of not maintaining deserving roads. |

**TABLE D5. Comments on how has the training affected the view of the role of Road Asset Management System in serving their Agencies**

| <b>QN 5. How has the training affected how you view the role of Road Asset Management System in serving Your Agency?</b>   |
|--|
| <ul style="list-style-type: none"> <li>➤ Asset information management system is only the small part of road asset management.</li> <li>➤ Change my mind on optimization of resources based on tradition decision (Not based on Human Feelings).</li> <li>➤ Greatly improved my view.</li> <li>➤ Have a positive view of RAM.</li> <li>➤ I have been able to know more importance of having RAMS</li> <li>➤ I have realised that areas that needs improvement especially on resources allocation (long term planning) and monitoring and evaluation (feedback)</li> <li>➤ I learned that in the context of budget constraints, which is the Mozambican case, the best way to achieve good optimization of using budget is through the AMS.</li> </ul> |



### QN 5. How has the training affected how you view the role of Road Asset Management System in serving Your Agency?

- I learned that in the context of budget constraints, which is the Mozambican case, the best way to achieve good optimization of using budget is through the AMS.
- I think if we will put in practice a lot of positive impacts on RAMS.
- Improve in implementation.
- Improve our mind-set.
- In the first place, I thought AM is for engineers only but now I know in order to make it better and for good result Asset Management is for everyone.
- Increase the knowledge of Roads Asset Management System.
- Increase understand of asset management concept and benefit of asset preservation.
- It has actual improved some of the modules that can be implemented for a better result in various projects.
- It has been an eye opener and it is my hope that there will improve in the institutions performance.
- It has made me to realise the importance of managing assets.
- It is the tools which will help my agency to proper manage road and best achieve its goals.
- It totally changed my view of the role of Road Asset Management System. From now on, I am going to rely on metrics to take any decision.
- Positive, since is the only way of optimizing resources of get information.
- Positively, it should not lead in RAMS practices development.
- Provide new skills to knowledge that will be applied.
- RAM is the key to ensure that roads are preserved in serviceable conditions. The optimization ensures that funds are utilised optimally and value for money is achieved.
- RAM system is the tool to support decision making and is a part of RAM framework.
- The role of RAMS is good for keeping road assets.
- The way I was managing my asset management, I need to improve.
- This is very useful program, that need to accelerate the procurement or improvement of our system to integrated RAMS.
- This practice is important for decision making, budgeting and intervention.
- Training has offered in depth knowledge of RAMS specifically the six blocks of RAMS.
- Using management system and application of GPS, RMMS, DROMAS. A board can arrive into equity resource allocation.
- Value utilization and value preservation have to go hand in hand so as to sustain the achievement made so far.
- Very inspiring and triggered in me.
- We are still at the lowest level and I have realised possible areas which need improvement in order to move from where we are.

**TABLE D6. Comments on the Question: Did the trainers respond adequately to your questions?**

The Average Rating was: **4.46** [on the scale 1 to 5]

| Comments on the Question: Did the trainers respond adequately to your questions?   |
|--|
| <ul style="list-style-type: none"><li>➤ Absolutely yes.</li><li>➤ And there was a good exchange of experience from other countries.</li><li>➤ Excellent</li><li>➤ Excellent</li><li>➤ The resource person Prof. Mrawira is the best not only in Asset Management practice but also he is experiences well both for Tanzania and abroad. Big up to him.</li><li>➤ YES</li><li>➤ YES</li><li>➤ YES</li><li>➤ YES</li><li>➤ YES</li><li>➤ YES, all issues related to RAM are well addressed.</li><li>➤ Yes, Most of time they responded with real examples that was very good and understandable.</li></ul> |

**TABLE D7. Results on Question 7: How would you rate the overall quality of the workshop?**

The average rating of all the respondents was **4.16** [on the scale 1 to 5]

**TABLE D8. Results on Question 8: “Do you feel that Road Asset Management System will improve your work and/or the effectiveness of Your Agency?”**

A total of **43** Participants responded, “**Yes.**” Six participants left the question blank.

**TABLE D9. Results on Question 9: “Now that you received this training or road asset management, what is your estimation of the current level of maturity (on the IM<sup>3</sup> scale) of Road Asset Management System at your Agency?”**

The average rating of all the respondents on the IM<sup>3</sup> scale is **3.18**

**TABLE D10. Results on Question 10: List three key areas of asset management that you feel need to be improved in the short term to make Road Asset Management System better at your agency:**

| Comments: Three key areas of asset management that need to be improved in the short term  |
|---|
| <ul style="list-style-type: none"> <li>➤ Prioritization.</li> <li>➤ Changing mind-set of people.</li> <li>➤ 1. Design of projects. 2. Monitoring &amp; Evaluation. 3. Payment &amp; Auditing.</li> <li>➤ 1. Enhance organisation mind-set. 2. Management support to make Asset Management</li> <li>➤ 1. HR improvement in term of trainings and recruitment. 2. Awareness campaign to management and staff in general on the importance of RAMS.</li> <li>➤ 1. Implementation of RAMS by all agencies. 2. Appropriate communication to key decision makers to attain buy in and political good will. 3. Sensitization of RMS to all stakeholders.</li> <li>➤ 1. Importance of long-term planning and traditional planning. 2.Importance of performance measure, monitoring and feedback. 3. Asset information management system to be more holistic.</li> <li>➤ 1. Improving in planning. 2. Make the government understanding the importance of it.</li> <li>➤ 1. In long-term and medium planning. 2. In performance measure and monitoring.</li> <li>➤ 1. Long-term planning. 2. Asset monitoring. 3. Road asset information.</li> <li>➤ 1. People's mind set / involve everyone in the agency - Education. 2. Monitoring and performance measures. 3. Feedbacks.</li> <li>➤ 1. Planning and Budgeting. 2. Information system management. 3. Monitoring and Evaluation.</li> <li>➤ 1. Policy and strategic direction. 2. Long-term and tactical planning. 3. Asset information management system.</li> <li>➤ 1. Policy and strategic direction. 2. Long-term and tactical planning. 3. Performance measures, monitoring &amp; feedback.</li> <li>➤ 1. Policy and strategic direction. 2. Long-term and tactical planning. 3. Operation planning and Budgeting.</li> <li>➤ 1. Policy and strategic direction. 2. Practical Planning. 3. Operation and Budgeting.</li> <li>➤ 1. Policy and strategic direction. 2. Practical Planning. 3. Operation and Budgeting.</li> <li>➤ 1. Strategic thinking. (Big picture) 2. Particular way of doing things. 3. Decision by using support tools.</li> <li>➤ 1. Systematic collection of data using IT technology. 2. The planning department needs to be reorganized. 3. The RAM will be part of our organization.</li> <li>➤ 1. There is missing block or items of Accident report, Incident management system from Road Safety Audit. 2. Should be integrated with other system like epicor.</li> <li>➤ 1. There is missing block or items of Accident report, Incident management system from Road Safety Audit. 2. Should be integrated with other system like epicar.</li> <li>➤ 1. Web based RMS - ongoing process. 2. Performance measurement and Monitoring improvement. 3. Integration with HDM-4 for optimization of annual maintenance works.</li> <li>➤ 1. Active role in planning of road maintenance work to achieve medium and long-term result in road condition 2. Harmonization of RFB strategic plan and RA strategic plan so have to have common direction in Road Maintenance.</li> <li>➤ 1. Capacity building, Commitment of the managers, Equipment to asses Roads Network Condition.</li> <li>➤ 1. Capacity building, Commitment of the managers, Equipment to asses Roads Network Condition.</li> <li>➤ 1. Long term planning and resource allocation. 2. Monitoring and evaluation.</li> <li>➤ 1. Road safety measures to be included in the system 2. Accidents management to be included in the system</li> <li>➤ Bridge maintenance and management modules.</li> <li>➤ Changing an organisation culture in related to RAM.</li> <li>➤ Collection of data related to roads resources, Improve the RAMS, Use of RAM in place efficiently.</li> <li>➤ Creates bigger awareness on mind-set change.</li> </ul> |

**Comments: Three key areas of asset management that need to be improved in the short term**

- Data collection, Proper RAM tools, Change of optimisation behaviour to assimilate RAM in our business process.
- Funding, Planning and Monitoring.
- Human skills, business process and management system.
- Importance of long-term planning, budgeting, monitoring and optimization.
- Improve existing system, performance and long term plans.
- Improvement is very important for our Roads Agencies in Tanzania (TARURA & TANROADS) and RFB).
- Improving DROMAS, Establishing proper units of Road Asset Management, Training of RAM.
- Increase Fund allocation from government, improve resources input in RAM, Skills sharpening to both technical and local person.
- Institutionalization of RAM in the management of the Annual Public Roads Program (APRP).
- Inventory, optimization.
- Long-term and Technical planning, lifecycle activities and Performance measure.
- Long-term planning, maintenance planning and operations, involvement of all staff in the RAM operation (RFB).
- Planning, Monitoring and Continue improving approach.
- Policy & Strategy, Long-term planning, Operation planning and Budget.
- Policy and strategic direction, information management (data management).
- Prioritization, Translating policies into actions & Performance measures.
- Understand the concept, Change the mind-set and Implement RAMS.

**TABLE D11. Results on Question 11: Give any other general comment**

**General Comments of the Course**

- 1. Continuing use local experts, 2. Recommend the Ministry of Education to include the AMS in the college/university level, 3. Conduct tailored training to infrastructure development agencies and ministries.
- 1. Include multi-lingual translators who will smoothen communication during the course and seminar. Proposed languages are Kiswahili, English, French and Portuguese. 2. Learning session should be limited to maximum of 6 hours for efficient and understanding the materials.
- 1. More stakeholders should be encouraged to attend this course. 2. Time should be minimized. 3. Site visits and tours are important so that costs are incorporated in the formal invitation.
- 1. The course was positive,
- 1. The training hours should be reduced to 9:00. 2. Site visit to key infrastructure projects in the area should be part of the program. 3. Allow more presenters from different background.
- 1. There is a need to introduce this course of asset management to schools/universities. 2. Training timetable was too long. The content of seminar need to be shorten. 3. Generally the content of seminar was good and Excellent.
- Asset Management course to be included in curriculum of our colleges / universities, Asset management training should be conducted to member of parliament. The program should have group activities.
- Consider having at least one facilitator out of Africa in order for the participant to understand what others are doing.
- Fee for participation is very high, reduce fee in order to provide opportunity to many institutions to participate.

## General Comments of the Course

- For the conference consider, factoring in the site visits, session for sharing and interactions including a cocktail and farewell dinner (you can factor all this in the costs)
- Further seminars to incorporate small group works to faster more discussions between participants especially those from other country.
- I suggest next time to have a site visit. I enjoyed the lectures.
- Improve training delivery by having group work especially in the afternoon sessions.
- In order to advice country is better to have tours for all participants to decision makers (parliament)
- It was wise workshop if possible next time to have more case from different country.
- It will be good if all delegates who have registered from other countries to be met and welcomed at the airport to enhance a smooth transition into the country.
- Mind-set change is of vital importance for our Road Network and Transportation sectors especially for Tanzania Decision Makers.
- Since we are in the practical world, there is need to develop a software which will be able to give results depending on the input received.
- TARA needs to be there for participants. Lots of challenges.
- The course is very intensive; I suggest next time to have a site visit.
- The course was very comprehensive.
- The lectures were very insightful; I am glad to be part of the seminar like this; from Africa to Africa.
- The need of presentation of how system are being used by all Roads Agencies and Road Funds in each country.
- The planning committee needs to improve, especially regarding lodging, visas & reception issues.
- The program was conducted well and break time session are important for sharing experiences.
- The training was so fruitful just need to be packed to suit intended group.
- The workshop had a lot of valuable theoretical information.
- The workshop was too detailed to be understood within short time.
- Time management on side of participants as well as course moderator.
- Training was so good and excellent, thanks to the secretariat team and Prof. Mrawira for his reputable lectures.
- We will ensure we provide all support to Roads Agencies.
- Well organized.
- Well organized. Workshop; but next time make proper arrangement for tours/site visits.
- Workshop was perfect.
- Workshop was perfect.

## APPENDIX E. ROUND TABLE DISCUSSIONS – DECISION-MAKERS’ SEMINAR HELD ON SATURDAY 12<sup>TH</sup> JUNE 2021

### ***I. ROUND TABLE DISCUSSIONS Captured by Eng. Severin Materu***

Prof. Mrawira: OPENING:

Provided an overview and highlight of the 5-day course and goals for the today’s seminar.

#### ***Prof Shemdoe - Opening Remarks.***

- The seminar will come out with communicable recommendations for betterment of our countries.
- Summary and recommendation would faster social economic growth.
- Ensure that the Roads Asset is properly managed.
- Come out with proper and recommendations for growth of Roads.

#### ***Namibia AMFA Chief and CEO’s Comments.***

Overview – Africa needs to catch up with Roads Asset Management.

##### **Useful recommendations and actions.**

- International Standard Organization ISO 55000.
- Why AMS
  1. Sector is important in the economic growth.
  2. Increasing Network need.
  3. Appropriate System that responds quickly to;
    - Decision making.
    - Use of HDM4 in optimization.
- Contract Management System for internal payment system.
- Data collection speed.
- Work based system.

#### ***Eng. Victor Seff TARURA CEO’s Comments***

- How much.
- Sustainability.
- Under funded.
- DRMS.
- AFCAP tools of Asset Management.

## **IDENTIFIED CHALLENGES**

- Shortage of staffs and Funds.
- No policy guidelines – AMS.

## **FUTURE PLANS**

- Evaluations.
- Strategic Long-Term.
- KPI to be developed.

## **NAMIBIA EXPERIENCE (Eng. Sophie Tekie's Comments)**

- Had strategic plan 20 years now.
- Roads Authorities has Long-term plan.

Why RAMS:

- Independency and local oriented.
- Donors dependency has many challenges.

Key;

- HR is part.
- Independent Management of Rural Roads.
- Work for capital and maintenance work.

Information includes;

- new technology to monitor the network in real time.
- Roads safety under a different authority.
- Data collection is captured with accuracy.
- Flexible system to upload data of real time.
- Access to all staff in the Round Authority and stakeholders with limits.

## **Future plans:**

- Make your own system.
- Continuous Data Collection.
- Uploads data to publish data in web.

## **SUMMARY**

- Countries are at different level.
- Funding challenging.
- Some countries have RAMS at maturity e.g. NAMIBIA.
- ISO 55000 series.
- Countries implementation;

1. Management of Asset should be holistic for enjoyment of Economic of scale. All components.
2. No ownership by all AM enquires alignment.

## **PART TWO: ISO 55000 Series.**

- Core activities of the organization is AM.
- Increasing Value for Money.
- An Asset defined – Anything with value to the organization.
- Owning an Asset goes hand in hand with obligation to maintain it.
- Deliver core mandate of the corporate mandate (existence).

1. STRATEGIC ISSUES: Policy and Targets.

2. PLANNING CENTER:

- Maximize Asset Values.
- Test all scenarios.
- Analytical skills are needed.

3. BUDGETING.

4. SUCCESSFUL LEVEL.

- Detailed designs.5. (M & E)
- Dashboard to guide performance management. Identify areas due for correction.
- Measure likelihood of success.
- Scale able to handle all other issues alignment with strategic Agenda.
- Plans should be owned by all top down/down top.

### **BENEFITS of RAMS:**

- Better Decisions.
  - Influence decision through convincing.
  - Improve customer satisfaction.
  - How investment could be charted in the most optimal.
  - Ownership Assurance.
  - Mind-set to change attitudes.
- All employees in the organization are Asset Managers. Team work is necessary to achieve proper awareness that brings only change in mind-set.
  - Implementation requires commitment.
  - How do you adopt it?
  - Have an annual gathering to exchange expenses;



1. Success.
  2. Failure.
  3. Way forward.
- No country in the planet could expand its network by 10%.
  - Annual and program events must be extracted from long term plan (these must be long term plan in place to avoid shift in annual plan).
  - Data collection is expensive but it should be an excuse to avoid AMS.
  - Asset Value and Asset Condition.
  - AM implementation being a continuous process.

### **IMPLEMENTATION OF AMS IS ABOUT:**

1. Mind-set change.
2. CEO's to understand why they need AMS.
  - Asses oneself against ISO 55000 and see how you could stride ahead.
  - Do benchmarking.
  - Adopt best practice.

### **IMPLEMENTATION APPROACH OF THE AMS.**

1. Organization structure (appropriate).
2. Have a data system.
3. Quality assurance.
4. Data to be scale able to accommodate future needs.
5. System that allows Decision Making.
6. Mind-set change.

### **OBSERVATION FROM CONCLUSION**

#### ***Observations:***

1. Gap in funding.
2. Interference by politicians.
3. Limited understanding by politicians and Decision making.
4. How to address poor roads.
  - Manage them commercially by created Authorities.
  - User money to be maintained by Road Fund.
  - Diversion of the fund means double Taxation to roads users who are the taxpayers.
5. Road Fund are not independent.
6. Road Fund are not being fenced resulting into low capacity to maintain roads.

#### ***Conclusions:***

1. Risk management required.

2. Make timely decision.
3. Framework to provide linkage across board.
4. Total/holistic consideration and perception in AMS.
5. Required us to consider how we manage assets.

ISO 55000 maturity level 1 – 4.5

Plan to mature and reach Level 4 & 5 Need;

- Aim to maximize Asset Value.
- Digitalization transformation.
- Frame work strategy to link AMS components in the Organization.
- Ensure long term plans.
- HR consideration to ensure competence etc.

## Q & A

1. A road is constructed for low traffic instead of high/medium traffic.
  - a. It is dilapidated and required rehabilitation not repair and user RF money. What should be done.  
 -using Roads Fund money for rehabilitation is basically help of Tax Payer money which has negative effect of increasing Maintenance burden to the Network/Nation.
2. a. Thinking of separating Agencies from the Government. Let's think in holistic approach.
  - Fuel consumption globally is declining due to alternative energy sources that are discovered with other technologies being invented.
  - b. Should we think of new sources for road fund moneys as there might be a shift on the use of fuel as a source of energy?
  - c. Value of money contributed on tax. Are the people really getting the value of their money?

## **II. ROUND TABLE DISCUSSIONS Captured by Dr. Christina Kayoza.**

### **TOPIC ONE: HOW IS THE BUDGET DISTRIBUTED? WHAT ARE THE INDICATORS USED? HOW DO THEY COMPARE THEM AMONG THE DISTRICTS?**

#### ***Tanzania's Experience***

TZ 180 Councils.

#### ***Kenya's Experience.***

KENHA 40%, KURA 10%, KeRRA 32% - Country Roads.

Country roads network – semi autonomous before 2010 an Act described how the fund is allocated.

Look at the value of money of the Road Asset and the Economic benefit of the investment. Allocation and mechanism should be dynamic to provide for the change in the location.

How are the different Network Management?

Each roads agency has its own management system. The system required by RF are not used by the implementing Agencies.

Kenya is still in the learning stage. However, would wish to adopt the Namibia Experience and automate the entire system.

Each of the (4) Roads Implementation System has its own.

#### ***Namibia's Experience***

Road user system. Since 2000

- 80% - Road Authority (single) preservation. Manage ~ 300m USD/YEAR – New capital investment.
- 2% - invested into system local.
- 5% - Local Authority (autonomous) councils (to support what is locally collected).
- 2% - traffic enforcement (support to National TP).
- 4% - admin costs.

Government pay for Capital Investment only.

Since 2000 have managed to provide good value to tax payers. Namibia is ranked first in Africa 30 worldwide.

Extend RAM to ministry and local Authorities to have a Comprehensive National RAMS.

#### ***Eng. SOPHIE Tekie's (Namibia) Comments:***

For every \$ 1 not invested on maintenance, \$ 3 or more are lost from each tax payer (due to increased transport costs resulting from road deterioration).

Backlog is increasing each year due to lack of sufficient maintenance funding. Good relationship with Road Agencies.

Technology to educate constantly decision makers on how various sources are being used.  
Minimization of total transportation cost.

Splitting of Fund.

- 80%
- 20% - still some work to be done yet to adopt RAMS.

#### ***Namibia Mr. ALLY Comments:***

Inadequacy of funding. How do you prioritize your investment strategically?

- \$5 – 10M is not spent annually due to shortage in contract management.

#### ***SIERRA LEONE's Experience.***

Road Sector Reforms is still not in place. They are in the learning stage.

Road Traffic Fees as one of the sources.

Have one Road Authority in the entire Network.

### **III. ROUND TABLE DISCUSSIONS BY MR. ELIFADHILI MGONJA**

#### **COMMENTS ON OVERVIEW**

##### ***Q1. Raised by the director of roads Eng. Mativila.***

The available funds from the roads funds board is for maintenance of roads only. But currently the funds have been used to rescue the dilapidated roads; strategies which can be laid to ensure the availability of Rehabilitation funding.

##### ***Responses given by Prof. Mrawira.***

- We need to remove the “s” from the RAMS. What matter is Road Asset management; not the system (IT aspect). The IT is just a tool to support the management of assets. It can only be scoped according to competency of the staff and the maturity of policies & procedures in the agency.
- The road Asset must be well managed,
- Keep eye on the good assets first (before rehab or re-construction).
- To ensure that the road Asset are timely maintained to avoid rapid deterioration.

##### ***Namibia Roads Funds Manager Comments***

- Focus on
  - ❖ Save the good roads
  - ❖ Save the road user costs
  - ❖ Let the governments deal with the Marshall plans to revive the failed roads.
- Funding the maintenance gap let us not think in isolation the road maintenance and rehabilitation.
- Road fund is decreased year after the other, now the electric vehicle has been introduced,
- We have to think of alternative source for road maintenance due to change of technology.
  - value for money principle and value for money.
  - in terms of investment.
  - in terms of the assets managed.

##### ***POLARG Rep Comments***

- Road management systems **DROMAS** is not well fraction.
- RFB has developed one which has failed.

### ***OPENNING REMARKS - Prof. Mdoe:***

1. Started by thanking Almighty God.
2. He welcomed participants the outcome of Road Asset management road table discussion to come up with that the recommendations which will be shared with policy makers for the betterment of managing our Asset.
3. Put more effort in managing Asset we need to ensure that the Asset are well managed.

### ***KENYA Experience***

There are four Authorities managing the road network in Kenya.

- i. National Highway 40%
- ii. Urban roads 10%
- iii. Rural roads 22%
- iv. Country roads 15%

Kenya is still on learning stage; the Road management system are managed.

### ***NAMIBIA Experience***

Mainly funds are from road user charges 60% total fuel review 10% Allocated to road Authority 5 % Allocated to local Authority, 2% traffic enforcement.

- National traffic.
- municipal traffic.
- 4% Administrative coast of RFB.

Road Authority are in charge the governed is paying for construction, they have a ring fenced roads fund.

- Established since 2000 it has added good value in road Asset managed as a country they are haven one Road Asset management system.
- Prioritization to achieve proper maintenance.
- RFB is also managing external Resources got from the development partners.
- The road user charges are collected by the state.
- Fund other services e.g., Buying cars.

Guideline, policy to be in place to guide on how to collect and how to be use.

National road Authority Budget for maintenance is allocated my RFB use their maintenance need collaboration with local government maintenance need are completed from all region and sent to RFB -Sent the report on how the money has been used.

The fund is the road fund is obtained from selenite road safety licenses money from the governed one road Authority ministry of finance –road construction distribution

- 70% Road Authority
- 20% Local council
- 10% Administration

We are not there yet; Road Funds go to the Government single treasury account. The road fund is not ring-fenced are having political interference (state utilizing the fund).

#### ***MOZAMBIQUE Experience:***

- Internal fees
- Fuel levy
- Cross border
- Road fall

The road network is growing 10% to the municipal

10% to the district

80% National Road Authority

#### ***CEO of TARURA Comments***

Recommended the country to have one Asset management system each Agency to own and operate it is own interface.

#### ***TANROADS Rep. (Eng. Mlavi) Comments***

Recommended two systems each Agency to manage his own road Asset managed system. Each Agency to have the independent road Asset managed but roads fund board to the have a system which will integrate and receive the data and report.

#### ***TARURA's Rep (Eng. Moga) Comments***

Recommended to have different system.

#### ***KENYA Road Board (KRB) CEO***

Preferred to have one strong RAM system for all road agencies and counties.  
Recommendations is developing one road Asset managed system.

### ***LIBERIA Experience:***

Not all roads are having the same.

Each road Agency has their own the system to manage the road according to where they want to go

#### **Achieve Goals of the Agency**

1. The preference option is to have one: RAMS

Road management system for the country but the different Agency to handle interfaces.

2. To have different Road management system and RFB to have interface of integration.

- Technical Assistant to TARURA.
- How can the Road management system help? Funding from taxes.
- Huge traffic density Buy a vehicle
- No play-contribute Possible solution on bridge.

### ***KENYA KRB Comments***

- Vehicle insurance protect road furniture.
- PPP
- Ward off Agriculture Congestion.