

Economic Growth through Effective Road Asset Management (GEM)

Final Report



Civil Design Solutions

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Cover photo: GEM activities and rural scenes

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Abstract

The Research for Community Access Partnership (ReCAP) has provided technical assistance and capacity building initiatives to foster sustainable improvements in asset management performance in selected rural road agencies in Sub-Saharan Africa. Such assistance was provided in order to foster improvements in road asset management performance. The countries that participated in the project are Zambia, Uganda, Sierra Leone, Tanzania and the Western Cape region of South Africa. District road networks were selected in each country as a focus for the research project.

Central to the research methodology was the development of a specification to enable road agencies to assess their performance in asset management as a basis for self-improvement. The specification is based on the development of an objectively determinable "Road Sector Sustainability Index" which measures the extent to which six building blocks considered essential for achieving effective road asset preservation are satisfied in practice.

Simple tools were developed and piloted in five Sub-Saharan African countries to assess performance in rural road asset management and to achieve improvements over time. Periodic measurements of the condition of the project road networks, coupled with the collection of socio-economic data, were used to monitor the trend in road asset value, to assess the effectiveness of, and improvements in, asset management as well as the impact of road condition on the well-being of rural communities.

As the project draws to a close, it has been observed that severe shortcomings exist in the participating countries that preclude sustainable road asset preservation, particularly as regards maintenance funding. However, as a result of undertaking the GEM project, there is now an increased awareness of the importance of adopting a holistic approach to road asset management using simple and sustainable methods for monitoring road agency performance. On the whole, the project has achieved its objectives.

This Final Report summarises the activities and outcomes over a three-year period from November 2015 to the end of 2018. It is expected that the GEM project will be extended to early 2020 in order to consolidate the project achievements and roll-out the GEM approaches to other AfCAP countries. The continuation of the project will include expansion to new districts and new countries through targeted train-the-trainer sessions involving the people who participated in the current phase.

Key words

Rural Roads, Road Preservation, Asset Management, Baseline, Performance Monitoring

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The authors would like to acknowledge the significant contribution to the success of the GEM project of the participating roads agencies in Tonkolili, Kamuli, Chongwe, UNRA, TARURA and the Western Cape; and support from the ReCAP Project Management Unit at all stages of the project implementation.

Research for Community Access Partnership (ReCAP)

Safe and sustainable transport for rural communities

ReCAP is a research programme, funded by UK Aid, with the aim of promoting safe and sustainable transport for rural communities in Africa and Asia. ReCAP comprises the Africa Community Access Partnership (AfCAP) and the Asia Community Access Partnership (AsCAP). These partnerships support knowledge sharing between participating countries in order to enhance the uptake of low cost, proven solutions for rural access that maximise the use of local resources. The ReCAP programme is managed by Cardno Emerging Markets (UK) Ltd.

www.research4cap.org

Acronyms, Initialisms, Units and Currencies

\$	United States Dollars
AfCAP	Africa Community Access Partnership
AM	Asset Management
ARMFA	African Road Maintenance Fund Association
ARTReF	African Road and Transport Research Forum
AsCAP	Asia Community Access Partnership
AWP	Annual Work Plan
CAV	Current Asset Value
CDS	Civil Design Solutions
CRV	Current Replacement Value
DFID	Department for Further International Development
GAT	GEM Advisory Team
IAMM	Infrastructure Asset Management Manual
IQL	Information Quality Level
KDC	Kamuli District Council
km	kilometre
KLG	Kamuli Local Government
Le	Leone (unit of currency in Sierra Leone)
LVR	Low Volume Road
mUS\$	Million United States dollars
NCI	Network Condition Index
NCI _F	Network Condition Index (Formation)
NCI _P	Network Condition Index (Pavement)
NFI	Network Functionality Index
PIARC	World Road Association
PMU	Project Management Unit
PIT	Project Implementation Team
PO-RALG	President's Office – Regional Administration and Local Government
RAI	Rural Access Index
RA	Roads Agency
RAFI	Road Asset Funding Index
RAM	Road Asset Management
RAPI	Road Asset Preservation Index
RCI	Road Condition Index
RCI _F	Road Condition Index (Formation)
RCI _P	Road Condition Index (Pavement)
RDA	Road Development Authority (Zambia)
ReCAP	Research for Community Access Partnership
RFI	Road Functionality Index
RI	Roughton International
RMFA	Road Maintenance Fund Administration
RSSG	Road Sector Sustainability Grade
RSSI	Road Sector Sustainability Index
SC	Steering Committee
SLRA	Sierra Leone Roads Authority

TARURA	Tanzania Rural and Urban Roads Agency
TC	Trading Centre
TDC	Tonkolili District Council
TMH	Technical Methods for Highways
UK	United Kingdom (of Great Britain and Northern Ireland)
UKAid	United Kingdom Aid
UNRA	Uganda National Road Authority
UoB	University of Birmingham
US	United States of America
WC	Western Cape

Executive summary

The Research for Community Access Partnership (ReCAP) has provided technical assistance to selected rural road agencies in sub-Saharan Africa to achieve sustainable improvements in road asset management. The countries that participated in the project were Zambia, Uganda, Sierra Leone, Tanzania and the Western Cape region of South Africa. District road networks were selected in each country as a focus for the research project. The project was known as “Economic Growth through Effective Road Asset Management” (GEM) and its purpose was “to achieve economic and social benefits for local communities as a result of improved performance in road asset management”.

Five project objectives were identified during the Formulation Phase that could realistically be achieved in the project time frame:

1. Review literature and reports on existing and recent road management and maintenance programmes and identify ‘what works’ and ‘what doesn’t work’ in the type of environment likely to be encountered in the project area.
2. Develop a framework for measuring performance in road asset management appropriate to rural road networks and apply it in selected project areas.
3. Develop simple and appropriate tools for monitoring road condition and apply them in the project areas.
4. Develop simple indicators of economic and social impact of rural roads and monitor them in the project areas.
5. Achieve incremental (and measurable) improvements to asset management performance in the project areas over a three-year period.

All five of the project objectives were achieved. Central to this achievement was the development of a specification to enable road agencies to assess their performance in asset management as a basis for self-improvement. The specification is based on the development of an innovative, objectively determinable “Road Sector Sustainability Index” (RSSI), which measures the extent to which six inter-dependent, and hierarchically related building blocks are satisfied in practice (Objective 2). The building blocks include government policy and funding for roads, sector institutional arrangements, agency management, technical standards and the organisation of road maintenance. All six building blocks must be addressed to achieve effective road asset preservation. A road infrastructure score card system enables road agencies to monitor and compare their management performance internally as well as against participating organisations in other countries. Road agencies can determine gaps in their performance and to communicate the outcome to stakeholders. Improvements in the RSSI reported over the project period demonstrate the achievement of Objective 5.

Periodic measurements of the condition of the project road networks were undertaken in the project areas using a set of relatively simple tools developed by the project team (Objective 3). The first step in this process was the collection of road inventory data, which did not exist in most of the road agencies at the start of the GEM project. The visual condition assessments allow the agencies to monitor the condition of the network through a set of standard condition indices, and to estimate the value of the road assets.

The GEM approach and tools for monitoring performance in road asset management were shared with sector stakeholders and practitioners at regional and international events. A Project Implementation Team (PIT) was established to oversee project implementation and comprising representatives from each of the participating roads agencies. The PIT met on three occasions to discuss progress with implementation of the GEM methodologies in each participating country. A guideline for rural road AM has been produced and is known as the “Rural Road Asset Management Practitioners’ Guideline” (2019).

It soon became apparent during the implementation of the project that effective road asset management was constrained in most countries by the inadequacy of funding for maintenance. Very little maintenance was carried out on most the GEM project road network in 2017 and 2018 as a result of inadequate allocation of funds. This constrained progress with capacity building activities which were intended to improve the efficiency of maintenance operations.

In order to address the crucial issue of maintenance funding, the GEM project started a process of higher-level engagement and research on the constraints faced by African governments. This initiative showed that a range of policies and strategies was required to improve the funding situation, including modifications to legislation governing road sector agencies, improved operational procedures for the national road fund agency, improved communication and greater discipline in the sector. It was also apparent that there are significant institutional weaknesses in the road sector with unclear lines of responsibility, staff shortages in road agencies and inefficient maintenance operations. Significant time and resources are needed to address these critical issues.

Data were collected in rural communities in the project areas to assess any changes in rural livelihoods as a result of road maintenance (Objective 4). Training was provided to the road agencies in the collection and analysis of the data. Development of socio-economic indicators was helpful in addressing the paucity of data for continuous monitoring and evaluation (M&E) of rural roads performance. The GEM interventions have been instrumental in strengthening data collection capacities of rural roads agencies.

The poor funding situation for maintenance activities during the project period made it difficult to detect measurable improvements in the socio-economic conditions of the communities. Furthermore, some positive socio-economic outcomes that were observed could not be confidently attributed to the condition of roads. There is a need to further develop the impact assessment approach to isolate socio-economic effects related to road asset management from other influences on the local economy. A positive outcome, at institutional level, was that the socio-economic impact monitoring process has been transformative in helping engineers and technicians to look beyond the physical aspects of rural roads towards effects of sector politics and policies, and the overall benefits of asset management on the well-being of the local communities.

Despite the significant challenges of establishing effective road asset management in rural road agencies there have been several positive impacts in the participating countries since the commencement of the GEM project implementation phase in mid-2016. These include:

- an enhanced appreciation of the key factors that affect the performance of road agencies;
- more rigorous monitoring of road networks and evaluation of their performance;
- increased confidence of road agency managers at local authority level in executing their mandate;
- improvements in the reported RSSI indicator values since the baseline of 2016; and
- strengthened linkages and dialogue between local government agencies and their parent ministries.

The success of the GEM project implementation led to requests from each of the participating countries to extend the project to other rural roads networks in the country. However, the sustainability of GEM project achievements and further geographical expansion depends on continued support through a programme such as ReCAP. The Association of Road Maintenance Funds in Africa (ARMFA) has been identified as a possible a coordinator for the roll-out of GEM on a wider basis in Africa; but ARMFA lacks capacity and resources to manage a project of this nature and would need the support of a development partner.

1 Introduction

1.1 Background

The Research for Community Access Partnership (ReCAP) supports research and capacity building activities in Africa (Africa Community Access Partnership – AfCAP) and Asia (Asia Community Access Partnership – AsCAP). The programme is funded by UK Aid and is managed by Cardno Emerging Markets. Cardno entered into a contract with Civil Design Solutions (CDS)¹ of Mauritius to provide technical support for the delivery of a three-year regional research project on improved management of rural roads.

The project was initially known as “Research on New Asset Management Approaches for Maintaining and Improving Local Road Access”, but the title was changed to “Economic Growth through Effective Road Asset Management – GEM” at the inception of the project. Sierra Leone, Uganda, Zambia, Tanzania and the Western Cape Province of South Africa participated in the project. The research process and outcomes were shared with other ReCAP-participating countries and the wider stakeholder group through ReCAP regional meetings and international conferences.

The project commenced in November 2015. It was implemented in two phases: The Formulation Phase from November 2015 to July 2016 and the Implementation Phase from July 2016 to February 2019. The Implementation Phase was contingent on a successful outcome of the Formulation Phase.

1.2 Purpose of the Project

The methodology for undertaking the project was developed during the Formulation Phase to provide an overarching framework for the project and guide its implementation. The Purpose of the project was “to achieve economic and social benefits for local communities as a result of improved performance in road asset management”. The purpose statement emphasises the important link between road asset management and the wellbeing of rural communities.

It was recognised from the outset that the purpose of the GEM project could not all be achieved within the limited time timeframe of the project². However, by establishing appropriate tools for rural road asset management, widely disseminating the GEM approaches, and building capacity in rural road agencies, it is expected that long term benefits will be derived by the ultimate beneficiaries of the project, which are rural communities in sub-Saharan Africa.

1.3 Research Objectives

The objective of the project, as stated in the Terms of Reference, was “to identify, test, document and disseminate an improved approach, or approaches, including institutional arrangements, for an approach to asset management for the maintenance and improvement of local access to rural areas in sub-Saharan Africa”. The focus was on “tertiary roads serving local communities in general and the rural poor in particular”.

The objectives of the project were clarified during the inception phase and rephrased as follows:

- Review literature and reports on existing and recent road management and maintenance programmes and identify ‘what works’ and ‘what doesn’t work’ in the type of environment likely to be encountered in the project area.
- Develop a framework for measuring performance in road asset management appropriate to rural road networks and apply it in selected project areas.

¹ CDS took over the management of the project from Roughton International (RI) in July 2016.

² See the Mobilisation Report (Formulation Phase) dated 10th December 2015 (page 6): “It is noted that the total current duration of the project is envisaged as 27 months. It is evident that this length of time may not be adequate to make meaningful progress in addressing the significant challenge of rural road maintenance in Africa”.

- Develop simple and appropriate tools for monitoring road condition and apply them in the project areas.
- Develop simple indicators of economic and social impact of rural roads and monitor them in the project areas.
- Achieve incremental (and measurable) improvements to asset management performance in the project areas over a three-year period.

1.4 Approach

The objectives of the GEM project supported a broad approach to rural road asset management under the framework of the “Road Preservation Pyramid” (Figure 1, Pinard *et al*, 2016). The approach emphasises the importance of addressing all six building blocks of the pyramid, that is the External, Institutional, Management, Financing, Technical and Operational aspects of road asset management, in a hierarchical manner. Thus, the relative importance of the building blocks is indicated by their position within the pyramid structure which illustrates the need to build upwards from its the foundation (the External Building Block) rather than downwards from the upper level Building Blocks.

Figure 1: Road Preservation Pyramid



The approach to the project was designed to foster self-reliance in road agencies in the project areas and to encourage greater accountability to road users and other sector stakeholders. It provides flexibility and opportunities for the participating road agencies and their stakeholders to determine their own performance in rural road asset management. The approach focuses more on improved performance in road asset management than on any specific or pre-conceived road asset management systems or institutional, management and funding arrangements. Support to the process was provided through demand-led technical assistance from CDS advisers who made periodic visits to the participating countries.

1.5 Participating Agencies

The roads agencies that participated in the project were:

- Tonkolili District of Sierra Leone;
- Chongwe Municipality of Zambia;
- Kamuli District of Uganda;
- The Uganda National Roads Authority (UNRA);
- The Tanzania Rural and Urban Roads Agency (TARURA); and

- The Department of Transport and Public Works of the Western Cape (RSA)³.

The project representatives of the participating countries were as follows:

Uganda:

- UNRA: Dr Mark Henry Rubarenzya (AfCAP National Coordinator for Uganda) and Dr Emma Mbabazi (Research Fellow); and
- Kamuli District: Eng Grace Mulondo (District Engineer).

Zambia:

- Road Development Agency (RDA): Eng Presley Chilonda (Research Engineer); and
- Chongwe Municipal Council: Eng Peter Banda and Eng Patrick Mushingi (Director of Engineering Services).

Sierra Leone:

- Sierra Leone Roads Authority (SLRA): Eng Tamba Amara (Feeder Roads Department) and Eng Mahomed Lahayi (District Engineer); and
- Tonkolili District: Eng Sallieu Konneh (District Engineer).

Tanzania:

- TARURA: Eng. Vincent Lwanda (Materials Laboratory Manager) and Eng. Joseline Kagombora (Research Engineer).

Western Cape:

- Eng Melanie Hofmeyer.

1.6 Project Implementation Team

The Project Implementation Team (PIT) comprised representatives from each of the participating roads agencies and the technical assistance team (observer status). The purpose of the PIT was to facilitate sharing of experiences between the participating countries and peer review of progress with the implementation of the GEM methodologies. The PIT met on three occasions: November 2016 in Caledon in the Western Cape, November 2017 in Kampala and November 2018 in Lusaka.

1.7 GEM Advisory Team

The CDS Advisory Team that supported the implementation of the project was as follows:

- Team Leader: Robert Geddes;
- Road Maintenance Expert: Kingstone Gongera;
- Road Condition Monitoring Expert: Charles Bopoto;
- Rural Transport Economist: Camilla Lema;
- Institutional and Road Financing Expert: Mike Pinard;
- Communications Expert: Grace Muhia;
- Africa Road Financing Expert: Joseph Haule; and
- Road Asset Management Expert: Gerrie van Zyl.

The University of Birmingham (UoB) provided expert support in Road Asset Management to the project under the guidance of Dr Michael Burrow. Two UoB PhD candidates, namely Eng Robert Kakiiza (Uganda) and Eng Peter Kome (Sierra Leone), used GEM project data for their research work,

³ Then Western Cape participated in the project as an example of good practice in rural road asset management and as a role model for the other participating agencies. The Western Cape participation was self-supporting and not benefitting from ReCAP support.

The ReCAP Programme Management Unit provided oversight to the project through Les Sampson (November 2015 to July 2018) and, subsequently, Nkululeko Leta (August 2018 to February 2019).

1.8 Purpose of this Report

This is the Final Report for the project and presents a summary of the activities carried out from the initial mobilisation of the project team under Roughton International in November 2015 to the final event of the project, the Project Implementation Team meeting in Lusaka in November 2018. The achievements of the project are described, including the growth of capacity in the participating road agencies. A way forward is proposed for consolidating the gains achieved so far. The report should be read in conjunction with the GEM “Rural Road Asset Management Practitioners’ Guideline” (2019), which provides detailed guidance on implementing the tools for rural road agency performance assessment, road asset management, and social and economic impact assessment that were developed under the project.

2 Project Activities

2.1 Range of Activities

A wide range of activities was carried out over the project period in order to achieve its objectives. They included project management meetings, visits to the participating countries for training and mentoring of local partners, presentations and workshops at regional events, and three meetings of the Project Implementation Team (PIT). Meetings of GEM Advisory Team members were held regularly throughout the project period.

2.2 Management Meetings

The purpose of the management meetings was to discuss the project objectives and approach, progress with achieving the objectives, and the manner of resolving challenges and constraints. The management meetings held during the project period are summarised in Annex 1.

2.3 Visits to Participating Countries

The initial visits to the participating countries allowed the CDS Advisory Team to meet key stakeholders in the national government and local authorities that were identified for participation in the project. The team familiarised themselves with local conditions and the current status of rural road asset management and assisted the local partners to establish management arrangements for executing the GEM project in the country. On subsequent visits the team provided training and mentoring to the road agency staff in the implementation of the agency performance self-assessment (using the Self-Assessment Questionnaire), the GEM asset management tools (road inventory and condition assessment) and the collection of social and economic indicators in rural communities. Additional visits were made to Zambia for the implementation of pilot activities to strengthen communication between the district road agency and external stakeholders, and to review financing arrangements for the road sector.

The country visits carried out during the project period are summarised in Annex 2.

Typical photographs from the country visits are included in Figure 2.

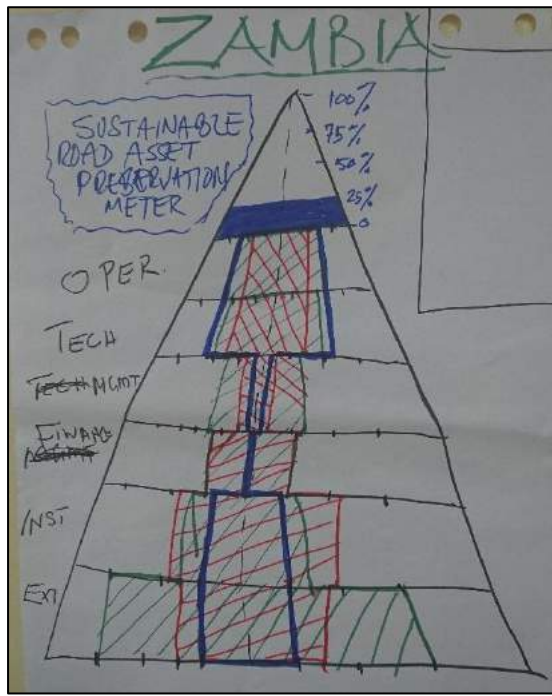
Figure 2: Photographs from the country visits



AM Gap Analysis Tonkolili District



Rural road conditions, Tonkolili



AM Gap Analysis Result, Chongwe



AM Policy Workshop Participants, Chongwe District



AM Policy Workshop Participants, Kamuli District



Interviewing a local trader in Uganda



Community meeting in Tanzania

2.4 Regional Events

The GEM project team participated in several regional events over the project period with the objective of disseminating information on the project design and facilitating and promoting the GEM approach to improving performance in road asset management. Feedback from participants at the events was used to refine the project approaches. In some cases, the GEM project conducted mini workshops to discuss specific aspects of the project, whilst at other events presentations were made by the Advisory Team.

The regional events held during the project period where the GEM project was represented are summarised in Table 1.

Table 1: Schedule of Regional Events

Date	Event	Location	GEM Participation
15 th to 17 th March 2016	International Conference on Transport and Road Research	Mombasa, Kenya	<ul style="list-style-type: none"> ▪ Two technical papers concerning project objectives and strategy presented in a plenary session. ▪ Workshop to discuss the proposed project approach with stakeholders including road network managers, engineers and rural transport professionals.
7 th to 12 th November 2016	15 th ARMFA Annual General Assembly	Abidjan	PowerPoint presentation of project objectives and methodology.
8 th to 10 th May 2017	9 th Technology Transfer Conference	Livingstone, Zambia	Workshop on rural road asset management.
20 th to 22 nd November 2017	ReCAP Inter-Regional Implementation Meeting (IRIM)	Munyonyo Resort, Uganda	<ul style="list-style-type: none"> ▪ Presentation on the GEM project to a plenary session; and ▪ PIT meeting for 2017.
19 th to 23 rd February 2018	16 th ARMFA Annual General Assembly	Addis Ababa	PowerPoint presentation of project objectives, methodology and achievements ⁴ .
9 th to 11 th October 2018	SARF/IFR/PIARC Regional Conference for Africa	Durban	<ul style="list-style-type: none"> ▪ Presentation of 4 conference papers; and ▪ Management meeting including members of the ReCAP PMU and Technical Panel.

The GEM project team is expecting to present papers or contribute to workshop discussions at four further regional and international events:

- 1 The ReCAP Inter-Regional Implementation Meeting in Kathmandu in February 2019;
- 2 The 9th Africa Transportation Technology Transfer Conference in Maputo in July 2019;
- 3 The 12th TRB International Conference on Low Volume Roads in Kalispell, Montana, USA, in September 2019; and
- 4 The PIARC World Road Congress in Abu Dhabi in October 2019.

2.5 Project Implementation Team Meetings

The road agency performance data were discussed at annual regional meetings of the participating road agencies. This group was known as the Project Implementation Team (PIT). The purpose of the PIT meetings was to enable the participating roads agencies to share experiences and knowledge and to encourage a greater level of accountability in their work. Where possible, the meetings were used for additional training and capacity development in rural road asset management.

The PIT meetings held during the project period are summarised in Table 2. Photographs from the 2018 PIT meeting are included in Figure 3.

⁴ The GEM project was represented by Nkululeko Leta, the ReCAP Deputy Team Leader.

Table 2: Schedule of PIT Meetings

Date	Venue	Format of meeting
15 th to 17 th November 2016	Caledon in the Western Cape, RSA.	<ul style="list-style-type: none"> ▪ Presentations by the participating countries - Western Cape, Uganda, Zambia and Sierra Leone including the road inventory and condition monitoring and country action plans; ▪ Presentations from other ReCAP regional projects and discussion on interaction between projects; ▪ Plenary discussion on road management issues; ▪ Discussion on the social and economic impact monitoring – purpose, indicators, progress with the baseline data collection and data analysis; ▪ Discussions between the UoB students and their supervisor (on the side-lines of the LIP meeting); and ▪ Site Visit to Overberg maintenance satellite office/workshop, visit to low volume sealed roads, demonstration of a wet blading operation and post site visit discussions.
21 st November 2017	Munyonyo Resort, Uganda	<ul style="list-style-type: none"> ▪ Review of resolutions arising from the first PIT meeting; ▪ Presentations by the participating countries - Western Cape, Uganda, Zambia and Sierra Leone including the road inventory and condition monitoring and country action plans; ▪ Update on collection of socio-economic indicators in each project area; and ▪ Identification of priorities for the following year.
20 th and 21 st November 2018	Cresta Golf View Hotel, Lusaka	<p>Presentation of updates on progress since the previous PIT meeting with each participating country reporting on:</p> <ul style="list-style-type: none"> ▪ RAM Performance self-assessment as at October 2018; ▪ Road condition and preservation indices for the GEM road network; ▪ Trends in asset value of the network over the last three years; ▪ RAM Action Plans - successes and failures; ▪ Funding of road maintenance programmes; and ▪ Social and economic impacts in project areas following maintenance interventions. <p>Focused discussions in workshop format on:</p> <ul style="list-style-type: none"> ▪ Organising and managing road maintenance; ▪ DROMAS network management system; ▪ Financing of road maintenance; ▪ Climate adaption in road asset management; and ▪ Communication as a component of road asset management.

Figure 3: PIT Meeting 2018



2.6 Reporting

Monthly progress reports were submitted throughout the implementation period of the project, with more substantive Quarterly Reports at three monthly intervals. Final reporting includes the “Dissemination Workshop Report”, which includes a detailed account of the 2018 PIT meeting, and the GEM “Rural Road Asset Management Practitioners’ Guideline.” The guideline describes the tools for monitoring performance in rural road asset management and the socio-economic impact of varying road conditions, and recommendations for implementing an effective communications strategy. A list of the reports that were submitted during the project period is included in Annex 3. The reports can be found on the ReCAP website <http://www.research4cap.org>.

3 GEM Indicators of Performance in Rural Roads Asset Management

3.1 Purpose of the Indicators

The GEM project has developed a set of indicators of performance in rural roads asset management. These indicators will potentially have a wide application in developing countries for monitoring AM performance. They can be used to compare the performance of road agencies in the same country, region or internationally, or they may be used by individual road agencies to monitor their own performance.

The methodology for collecting the GEM indicators is described in the GEM “Rural Road Asset Management Practitioners’ Guideline” (2019).

3.2 Definition of the GEM Indicators

The indicators of performance in rural road asset management that have been developed under the GEM project are summarised in Table 3. The primary indicators for monitoring purposes are the Road Condition Index (RCI), Road Sector Sustainability Index (RSSI) and the Road Asset Preservation Index (RAPI).

Table 3: GEM Performance Indicators

Indicator/Index	Initialism	Definition	Notes
Road Condition Index	RCI	Engineering index, a result of aggregation of visually assessed degree and extent of defects at road level. It can be further aggregated to give a Network Condition Index (NCI).	Road network to be specified.
Road Functionality Index	RFI	Provides an indication of the level of service offered by a road vis a vis comfort, safety and capacity at road segment level. A result of the aggregation of defects relevant to road functionality combined with the general passability of the road. It can be aggregated to give a Network Functionality Index (NFI).	Road network to be specified.
Condition Index (Pavement)	CI_P	Aggregation of degree and extent of defects relevant to the gravel layer only ⁵ , at road segment level. The CI_P feeds into the Asset Value calculation. It can be aggregated to give a Network Condition Index (Pavement) (NCI_P).	Road network to be specified.
Condition Index (Formation)	CI_F	Aggregation of degree and extent of defects relevant to the road formation only, at road segment level. The CI_F feeds into the Asset Value calculation. It can be aggregated to give Network Condition Index (Formation) (NCI_F).	Road network to be specified.
Condition Index (Structure)	CI_S	Aggregation of degree and extent of defects of culvert or bridge structure components. The CI_S feeds into the Asset Value calculation. It can be aggregated to give a Network Condition Index (Structures) (NCI_S).	Road network to be specified.
Road Sector Sustainability Index	RSSI	The extent to which the necessary policies, funding and institutional capacity are in place to ensure the sustainable provision of roads. Calculated as the	Road agency to be specified.

⁵ The GEM project road networks included only unpaved roads. The road condition indices can also be applied to paved roads.

Indicator/Index	Initialism	Definition	Notes
		weighted aggregation of attainment under the 6 Building Blocks in the Road Preservation Pyramid: External, Institutional, Funding, Managerial, Technical + Operations. The index is calculated from the scoring of the Self-Assessment Questionnaire.	Attainment (maturity) rated as: 0 - 0.2 = Very poor 0.2 – 0.4 = Poor 0.4 – 0.6 = Fair 0.6 – 0.8 = Good 0.8 – 1 = Very good
Current Asset Value	CAV	CAV is an estimate of the remaining value of an asset based on current condition, expected and remaining useful life.	
Current Replacement Value	CRV	CRV is an estimate of cost of replacing the asset with a modern equivalent of similar nature, based on current unit rates.	
Road Asset Preservation Index	RAPI	The ratio of the current road network Current Asset Value (CAV) divided by the road network Current Replacement Value (CRV).	Road network to be specified.
Road Asset Funding Index	RAFI	Capital funds provided for Asset Renewal (periodic, rehabilitation + reconstruction) divided by Quantified Needs for the same.	Road network to be specified.
Road Maintenance Funding Index	RMFI	The amount of routine maintenance funds provided for sustaining road network assets divided by the quantified maintenance needs of the network.	Road network to be specified.

It is noted that some of the indices listed in Table 3 were not collected during the GEM project period. This was due to the relatively short duration of the project and resource constraints in the road agencies. For example, condition data for individual drainage structures could not be collected so it was not possible to report the CIs. However, the road agencies were trained in the condition survey methodology and are able to apply the indicator in future as more resources become available. In addition, not all of the agencies could provide accurate disaggregated data on the funding provided for the different classes of work, and therefore it was not possible to make a reasonable estimate of the RAFI and RMFI. The agencies are aware of the importance of the indices and can be expected to calculate them going forward.

4 Status of Asset Management Performance in the Project Areas

4.1 Introduction

This chapter presents a summary of the status of asset management performance in the project areas at the end of 2018 relative to the baseline established in 2016. Data to establish the status as at end of 2018 were gathered by the project teams in September and October 2018 and presented at the 2018 PIT meeting.

4.2 Road Agency Participation

The project was initially implemented at district level in Uganda (Kamuli), Zambia (Chongwe) and Sierra Leone (Tonkolili). The Uganda National Roads Authority (UNRA) subsequently joined GEM as an agency responsible for rural roads. These four agencies collected a baseline of data in 2016, a follow up in 2017 and a third round of data in 2018.

The road agencies received training from the GEM Advisory Team in the administration of the performance Self-Assessment Questionnaire. The agencies then carried out the assessment independently. The first attempt, for the 2016 baseline, was reviewed in detail by the Advisory Team as an additional training intervention, and adjustments were made to the scoring.

The Department of Transport and Public Works in the Government of the Western Cape (RSA) provided a baseline index of good practice in rural road asset management for the project. The Western Cape implements advanced road asset management systems which were developed over a long period of time. The Western Cape collected road condition data for the GEM project on a selected road network and conducted annual self-assessments of its performance in RAM for 2016, 2017 and 2018.

Tanzania joined the GEM project in 2018 and collected only one round of data. The Tanzania Rural and Urban Roads Agency (TARURA) is managing the GEM activities and overseeing the participation of three districts (Kilindi, Mufindi and Mbinga) which collected the baseline data.

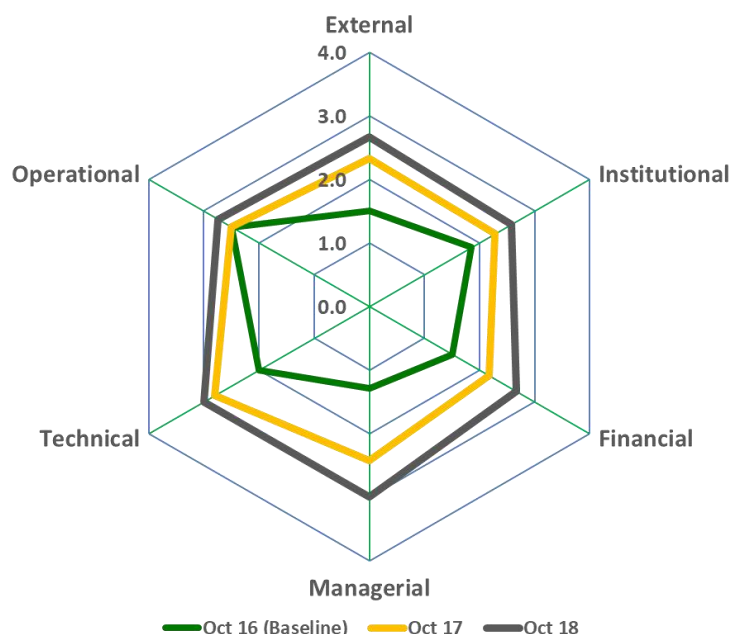
4.3 Uganda National Road Authority (UNRA)

The data presented by UNRA at the PIT meeting are included in Table 4. The UNRA RSSI radar diagram is given in Figure 4.

Table 4: Road Agency AM Performance Data Summary – UNRA

Aspect	Unit	Baseline (2016)	2017	2018
Network Condition Index (NCI)	%	66%	66%	52%
Network Functionality Index (NFI)	%	79%	69%	36%
Network Condition Index Pavement (NCI _P)	%	75%	84%	74%
Network Condition Index Formation (NCI _F)	%	87%	82%	78%
Current Replacement Cost (CRC)	mUS\$	11.74	11.74	11.74
Current Asset Value (CAV)	mUS\$	10.35	10.47	9.88
Asset Preservation Index (RAPI)		0.88	0.89	0.84
Road Sector Sustainability Index (RSSI)		0.41	0.59	0.68
Road Asset Management Maturity Level		Fair	Good	Good

Figure 4: UNRA RSSI Radar Diagram



Improvements to the UNRA RSSI are due to increased staff training in UNRA and improvements to the management of the organisation. Procurement processes have improved, for example low value items are now procured at station level. This has improved performance in road maintenance. An Emergency Response Plan (ERP) was coordinated from headquarters level and is now being implemented at station level. Quality control processes have been revamped and the laboratory is testing compaction levels on re-gravelling works. Regional Quality Control Teams are being established. Staffing at Jinja station increased from 15 to 32 since 2016 and additional resources have been provided to the station, including new supervision vehicles. Technical Audits are being undertaken, both internal and external, including by the Attorney General’s office.

The previous term maintenance programme elapsed in 2017. Delays in the procurement process for new framework contracts for routine maintenance negatively affected the condition of the roads in 2017 and 2018. This is shown in the drop in the Functional Index and reduction in the RAPI. The use of three-year framework contracts is expected to reduce future procurement delays

4.4 Kamuli District (Uganda)

The data presented by Kamuli District at the PIT meeting are summarised in Table 5. The Kamuli RSSI radar diagram is given in Figure 5.

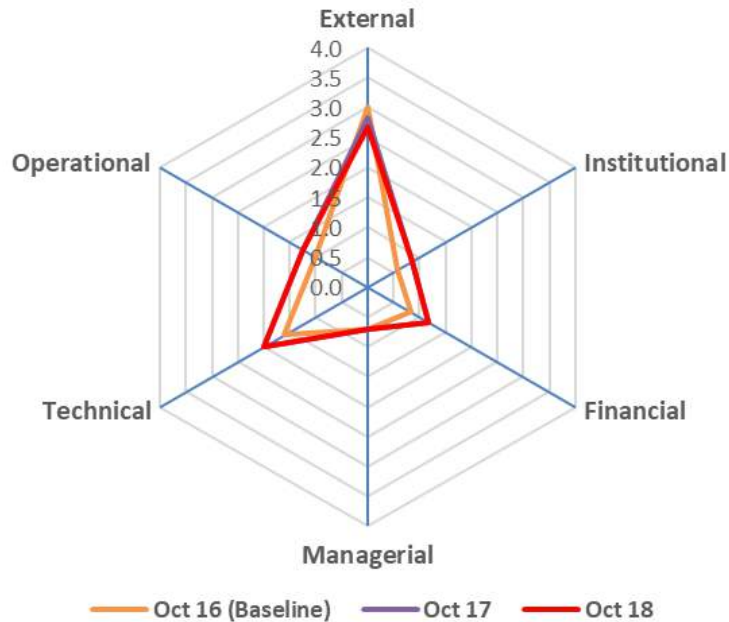
Table 5: Road Agency AM Performance Data Summary – Kamuli

Aspect	Unit	Baseline (2016)	2017	2018
Network Condition Index (NCI)	%	54%	54%	63%
Network Functionality Index (NFI)	%	81%	60%	62%
Network Condition Index Pavement (NCI _P)	%	81%	66%	74%
Network Condition Index Formation (NCI _F)	%	91%	90%	84%
Current Replacement Cost (CRC)	mUS\$	3.95 ⁶	4.34	4.34
Current Asset Value (CAV)	mUS\$	3.65	3.68	3.70

⁶ Some roads were incorrectly classified as earth roads for the baseline assessment, resulting in underestimation of the CRC.

Aspect	Unit	Baseline (2016)	2017	2018
Asset Preservation Index (RAPI)		0.92	0.85	0.64
Road Sector Sustainability Index (RSSI)		0.36	0.40	0.40
Road Asset Management Maturity Level		Poor	Poor	Poor

Figure 5: Kamuli RSSI Radar Diagram



A small improvement was noted in the RSSI over the project period. Improvements in the RSSI are due to training inputs from the GEM project and increased technical audits. Very little maintenance was carried out on the GEM road network in Kamuli District over the project period, mainly due to delays in disbursement of funds by the Uganda Road Fund (URF).⁷ The maintenance that was carried out in Kamuli in 2018 contributed to the reported improvement in road condition, but the significant improvement in the indices from 2017 to 2018 is probably more related to the subjective nature of visual condition assessment. More training is required for the road assessors to ensure a consistent approach to the annual assessments. In the Western Cape, for example, this task is outsourced to consultants who undergo rigorous training.

4.5 Chongwe Municipality (Zambia)

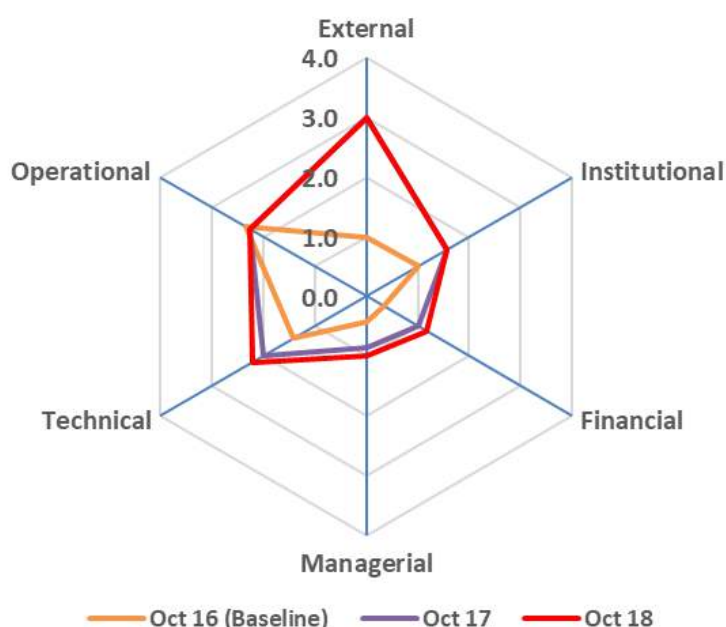
The data presented by Chongwe Municipality at the PIT meeting are summarised in Table 6. The Chongwe RSSI radar diagram is given in Figure 6.

⁷ See the report on Road Asset Management in Uganda in Quarterly Progress Report No. 6.

Table 6: Road Agency AM Performance Data Summary – Chongwe

Aspect	Unit	Baseline (2016)	2017	2018
Network Condition Index (NCI)	%	58%	58%	57%
Network Functionality Index (NFI)	%	66%	59%	58%
Network Condition Index Pavement (NCI _P)	%	79%	71%	69%
Network Condition Index Formation (NCI _F)	%	80%	91%	89%
Current Replacement Cost (CRC)	mUS\$	6.34	6.34	6.34
Current Asset Value (CAV)	mUS\$	5.57	5.03	4.98
Asset Preservation Index (RAPI)		0.88	0.79	0.78
Road Sector Sustainability Index (RSSI)		0.22	0.46	0.48
Road Asset Management Maturity Level		Poor	Fair	Fair

Figure 6: Chongwe RSSI Radar Diagram



The radar diagram for Chongwe shows a significant improvement from the baseline in 2016 to 2018, albeit from a low base and most of the scores still fall below 2.5. The baseline position was probably under-reported due to inexperience of the district team and RDA at the initial stages of the project. The Council is using the GEM tools in their management and operations, but overall the performance reported on asset management was fair. There has been an improvement since 2017 but many issues are still not adequately addressed, and very little maintenance was carried out on the project roads during the GEM project period. The National Road Fund Agency has a huge debt due to poor management of road contracts and very little funding is available for district road maintenance.⁸

4.6 Tonkolili District (Sierra Leone)

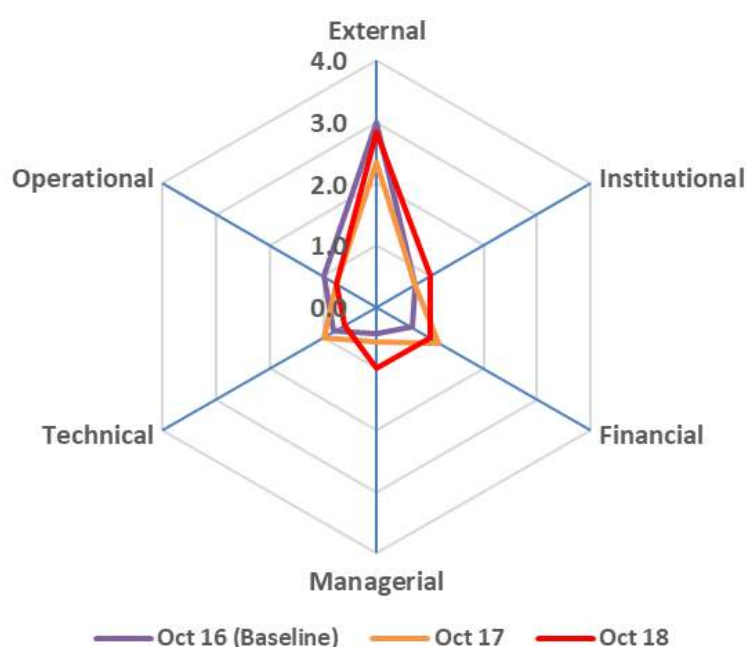
The data presented by Tonkolili District at the PIT meeting are summarised in Table 7. The Tonkolili radar diagram is given in Figure 7.

⁸ See the report on “Financing Rural Roads Maintenance in Zambia” in Quarterly Progress Report No. 6.

Table 7: Road Agency AM Performance Data Summary – Tonkolili

	Unit	Baseline (2016)	2017	2018
Network Functionality Index (NFI)	%	33%	33%	44%
Network Condition Index Pavement (NCI _p)	%	41%	38%	50%
Network Condition Index Formation (NCI _f)	%	52%	64%	75%
Network Condition Index (NCI)	%	35%	57%	67%
Current Replacement Cost (CRC)	mUS\$	6.67	7.44	7.51
Current Asset Value (CAV)	mUS\$	3.36	4.58	5.46
Asset Preservation Index (RAPI)		0.50	0.62	0.73
Road Sector Sustainability Index (RSSI)		0.30	0.32	0.37
Road Asset Management Maturity Level		Poor	Poor	Poor

Figure 7: Tonkolili RSSI Radar Diagram



Tonkolili District received direct support from the Sierra Leone Roads Authority (SLRA) for the management of the district road network. An SLRA engineer is based permanently in the district. However, the performance in RAM continues to be rated as “poor”. Some improvements have been made since the baseline in 2016 and the district has made changes to enhance revenue mobilization at district level since the new council was established in mid-2018. The council has become more proactive and development oriented and is committed to meaningful improvements in performance. Investments have been made in rural roads in the district with EU funding, which resulted in improvement in the NCI, NCI_p, NCI_f as well as the CRC, but there was very little routine maintenance carried out on the roads during the GEM project period. Recent changes in the management of SLRA and the Road Maintenance Fund Agency (RMFA) are expected to result in more reliable funding available for district road maintenance.

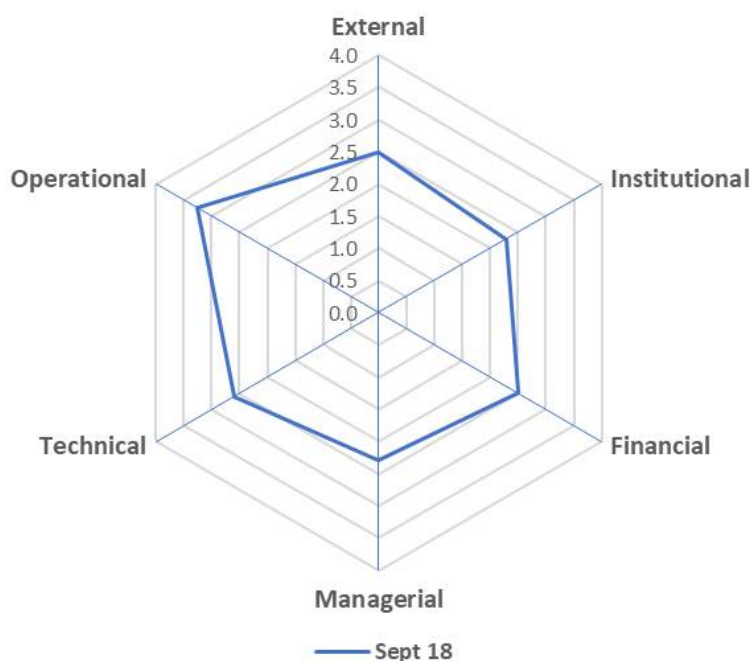
4.7 Tanzania Rural and Urban Roads Authority

The data presented by TARURA at the PIT meeting are summarised in Table 8. The data covers the three districts of Kilindi, Mufindi and Mbinga. The RSSI radar diagram for TARURA is given in Figure 8. Tanzania joined the GEM project in 2018 as part of a pilot for the roll-out of GEM methodologies to new countries.

Table 8: Road Agency AM Performance Data Summary – TARURA

Aspect	Unit	Baseline (2018)		
		Kilindi	Mufindi	Mbinga
Network Condition Index (NCI)	%	58%	67%	44%
Network Functionality Index (NFI)	%	59%	73%	39%
Network Condition Index Pavement (NCI _P)	%	N/A ⁹	73%	74%
Network Condition Index Formation (NCI _F)	%	77%	75%	79%
Current Replacement Cost (CRC)	mUS\$	1.03	2.64	1.55
Current Asset Value (CAV)	mUS\$	0.83	2.05	1.29
Asset Preservation Index (RAPI)		0.80	0.78	0.84
Road Sector Sustainability Index (RSSI) ¹⁰		0.63		
Road Asset Management Maturity Level		Good		

Figure 8: TARURA RSSI Radar Diagram



The RSSI score of 0.63 for TARURA indicates a “good” level of maturity in RAM. Funding arrangements for roads in Tanzania are better than most other countries in the region but TARURA reported that the quantum of the funding is still insufficient. In addition to this, TARURA does not have adequate supervision staff and equipment. Supervision of contracts for road works in remote areas is difficult, time-consuming and expensive. The District Engineer has traditionally been responsible for oversight of all district infrastructure, but under the new TARURA arrangements the district engineer is no longer required to oversee all infrastructure works in the district and is able to dedicate his/her time entirely to road infrastructure. This should improve the quality of supervision of road works.

Lessons learnt during the interactions with TARURA that could be taken into consideration during further roll-out of the GEM project are as follows:

⁹ N/A as no gravel roads surveyed

¹⁰ Indicated figure for RSSI applies to entire TARURA organisation.

- Senior decision makers within the organisation were involved from the onset and this assisted in the relatively smooth acceptance of the approaches promoted under the GEM project;
- It is important to quickly identify champions for the approaches, technical persons who will eventually use the tools must be engaged early;
- Research staff must be extensively briefed on the unique characteristics of the GEM approach: in TARURA's case the staff were more conversant with traditional research topics and this was a challenge in the early stages;
- Successful training sessions were undertaken in three locations with large groups; this demonstrated that technical persons are amenable to quickly taking up the GEM tools and it is possible to roll-out the project on a large scale; and
- Participants in the training sessions enjoyed interacting with rural communities, especially the engineers; this should be encouraged as it builds the communities' confidence in the road agency.

4.8 Western Cape Province

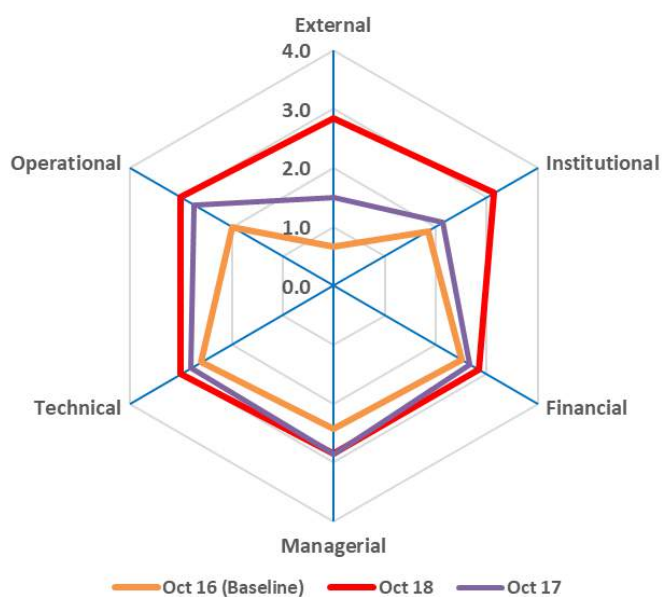
The RSSI data presented by the Western Cape is shown in Table 9. The radar diagram is included in Figure 9.

Table 9: Road Agency AM Performance Data Summary – Western Cape

Aspect	Baseline (2016)	2017	2018
Network Condition Index (NCI)	63%	64%	51%
Network Functionality Index (NFI)	ND	ND	66%
Network Condition Index Pavement (NCI _P)	ND	ND	56%
Network Condition Index Formation (NCI _F)	ND	ND	60%
Current Replacement Cost (CRC)	14.3	14.6	14.0
Current Asset Value (CAV)	5.9	4.8	2.8
Asset Preservation Index (RAPI)	0.41	0.33	0.18
Road Sector Sustainability Index (RSSI)	0.55	0.57	0.73
Road Asset Management Maturity Level	Fair	Good	Good

The data provided by the Western Cape shows a very low RAPI. This is due to significant depletion of gravel wearing course material on the project network. It is noted that none of the other participating road agencies is measuring gravel thickness, and the other agencies have a higher proportion of earth roads. The Western Cape CAV assumes that all roads should be gravelled. Nevertheless, given that the value of the road formation and structures should account for at least 40% of the CRC, it is likely that the RAPI for the Western Cape is understated. This issue will be addressed in more detail in the proposed project extension, including consideration of separate RAPIs for earth and gravel road networks.

Figure 9: Western Cape RSSI Radar Diagram



The performance of the Western Cape in road asset management is rated as “good”. This is the result of strong political support for roads, a high level of expertise in the Department of Transport and Public Works, and generally reliable maintenance funding. The development of the Western Cape’s AM has taken over 20 years. In the 2000s, the system suffered a loss in momentum, but in recent years the system has been revived and further improved. This is reflected in the RSSI and the radar diagram.

4.9 Road agency RSSI comparisons

A comparison between the Road Sector Sustainability Indices for the six participating agencies is shown in Table 10. The comparison shows that the centralised agencies (UNRA, TARURA and the Western Cape) have, not surprisingly, more advanced technical and managerial capacities than the three local authority road agencies. This is due to receiving more consistent and predictable funding and relatively better qualified personnel. Weak institutional arrangements coupled with poor funding, lack of political commitment and inadequate staffing adversely affects the performance of the three local authority road agencies, although improvements have been achieved over the GEM project period. The baseline position for Zambia is seen as an outlier as it was probably under-reported due to inexperience of the district team and RDA at the initial stages of the project.

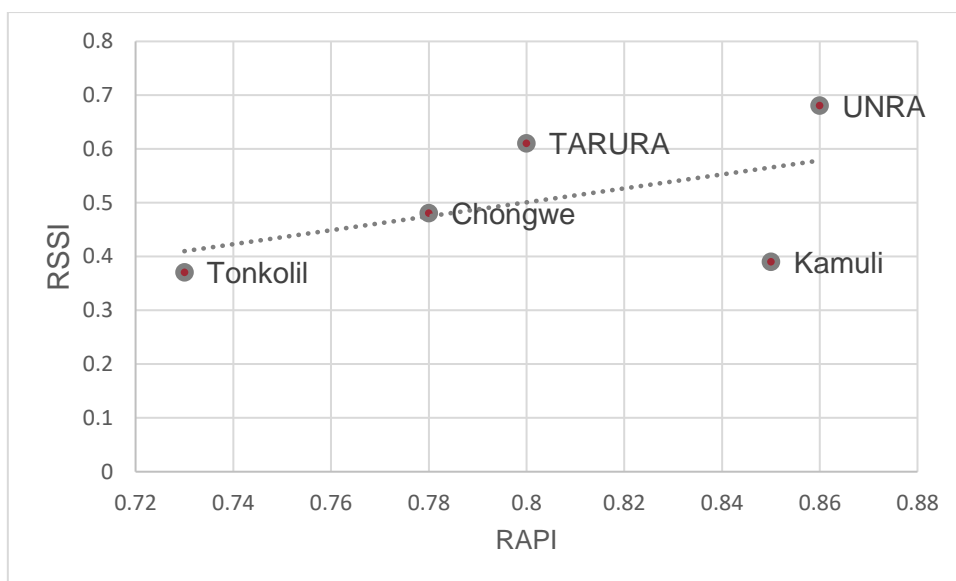
Table 10: Road Sector Sustainability Indices Summary – All Agencies

Road Agency	2016 (Baseline)	2017	2018	Change since Baseline
Tonkolili, Sierra Leone	0.30	0.32	0.37	+ 23%
Chongwe, Zambia	0.22	0.46	0.48	+ 114%
Kamuli, Uganda	0.36	0.40	0.40	+ 9%
UNRA, Uganda	0.41	0.59	0.68	+ 66%
Western Cape	0.55	0.57	0.73	+ 33%
TARURA, Tanzania	N/R	N/R	0.63	N/A

4.10 Relationship between road asset management performance and preservation

The Road Sector Sustainability Index (RSSI) is a measure of the road asset management maturity of an agency while the Road Asset Preservation Index (RAPI) is a measure of the extent of preservation of the road assets. The relationship between these values for the road agencies participating in the GEM project is shown in Figure 10 (2018 values). TARURA and UNRA have relatively high RSSI scores because they are national road authorities, and therefore are placed above the trend line on the graph. In both cases the RAPI is calculated on a small part of the rural road network that is under the responsibility of the authority and its condition may not be representative of the entire network. The relatively high RAPI score for Kamuli is probably linked to the high proportion of earth roads in the district (see Section 4.8).

Figure 10: Relationship between RSSI and RAPI



An assumption of the GEM project was that an increase in the maturity of the road asset management of an agency would translate into improved preservation of its road assets. The data presented in Figure 10 shows a trend of increasing RAPI with increasing RSSI which supports this assumption. However, it is noted that there may be a long-time lag between the achievement of improvements in some of the building blocks of the road preservation pyramid (which results in an improved RSSI) and improved road condition, particularly when funding for maintenance of the roads is not available. This is the case with TARURA, which was recently established and has adopted sound asset management systems, but these are yet to translate into improved road condition. The collection of data over a much longer period is needed to verify this assumption.

From Figure 10 it is evident that centralised agencies are receiving a larger portion of the funding and are better equipped to deliver road maintenance than the district road agencies, and hence score higher on the RSSI and RAPI.

5 Maintenance Planning and Implementation¹¹

5.1 Maintenance management

In all the three local authority road agencies that participated in the GEM project, very little maintenance work was carried out over the project period due to lack of funding and resources. However, the road condition surveys and inventory information have helped the road agencies to better quantify the amount of work that is required to be undertaken on each road. The road asset evaluation provides a guide to planning and budget estimates for future funding requests.

Due to the continued deterioration of the roads in the three districts, the extent of remedial work now required is beyond routine maintenance in many cases. Most of the roads now require substantial rehabilitation works to bring them to a maintainable condition. The planning for capital works, periodic maintenance and routine maintenance activities will have to recognize this disparity and equally the funding of works needs to take cognisance of the prevailing situation. The GEM project has made the roads agencies, including road funds, more aware of the effects of lack of funding on road condition as well as the need for effective planning for the use of the inadequate funding they are receiving.

Communication with higher level decision makers on funding for roads is part of the External building block of the Road Preservation Pyramid. Its importance is emphasised in the GEM “Rural Road Asset Management Practitioners’ Guideline”. As the road agencies become more mature in RAM it is expected that they will be able to communicate more effectively at all levels, including with political decision makers. Chapter 7 provides a summary of communication activities carried out on a pilot basis under the GEM project in Zambia.

The GEM project has developed standard formats for the identification of routine, periodic and rehabilitation works, and road agencies are familiar with the planning procedures. The road agencies are encouraged to prepare comprehensive work plans and submit them to the Road Fund. These submissions will help to keep track of the funding deficit and assist in measuring the performance of each road agency based on the planned works and what works were eventually funded. This process needs to be standardized for all road districts to allow the funding authority to evaluate submissions before allocation of funds.

The road inventories and condition surveys carried out under the GEM project have provided details of the roads in each participating district and their state. Based on this information, the districts can now produce short, medium and long-term plans to rehabilitate, repair and maintain the roads. Through the consultation processes now in place within the districts, it is possible to not only prioritize the roads according to demand but also to utilise the available funding in an optimal manner. The GEM project has developed standard forms for producing annual maintenance plans that provide a detailed breakdown of activities and costs. These forms also assist in programming of works within a given time frame.¹²

Standard reporting forms for monitoring maintenance works have also been developed and introduced to all the districts. These forms can be maintained in electronic format and analysed periodically to inform future decisions by management. The paper form is used for collecting information from the field and handed to the district engineer to enter the data into the relevant reporting files. The GEM project has initiated a basic reporting system and keeping of records within the districts. This practice needs to be embedded and sustained as routine practice within the road agencies, a key activity for the proposed project extension.

5.2 Capacity Building in District Councils

The GEM project has engendered an understanding within the participating countries of the importance of having an effective asset management system within the organization. Road inventories have been established as well as procedures for road condition surveys. Further capacity building is needed to help district council personnel to put into practice the training received during the project period. This will require either an extension to the GEM project under ReCAP or support from another development partner. The districts generally do not have resources to send their staff on training courses. A staff exchange programme

¹¹ The chapter is based on findings and recommendations included in Quarterly Progress Report No. 5.

¹² The standard forms are included in the GEM “Rural Road Asset Management Practitioners’ Guideline” (2019).

with road agencies like the Western Cape would provide a good opportunity for district staff to learn from experiences elsewhere.

5.3 Maintenance Funding

The establishment of road funds in the four participating countries has not always resulted in improved funding of rural road maintenance activities.

The reasons for inadequate funding being available for rural road maintenance include:

- Lack of clear policies that commit to adequate funding for road maintenance.
- A general insufficiency of road user charges and/or state budget allocations for maintenance;
- Failure of road funds to establish control over road user charges, which continue to be controlled by the Treasury in most countries;
- Poorly defined procedures for road agencies to apply for maintenance funds;
- Low capacity at district level to provide all requirements needed to access funds;
- Lack of or insufficiency of funding for rural roads, with the majority of such funding being allocated to the primary road network, and
- Mistrust and poor communication between road funds and road agencies.

Specific problems at the country level include:

- Zambia: The road sector has accrued massive debts exceeding US\$500 million through letting of road contracts without secured funding. Road user charges that should be used for maintenance are being used to clear this debt.
- Sierra Leone: The Road Maintenance Fund Administration (RMFA) started implementing its own maintenance projects in the run up to the 2018 elections, by-passing the Sierra Leone Roads Authority (SLRA) and local authority road agencies. Following the elections, and a change in government, the senior management of the RMFA has been changed and it is expected to revert to its legal mandate, including a constructive working relationship with the SLRA.
- Uganda: EU technical assistance in the Uganda Road Fund Agency is expected to improve efficiency of operations but the URF has no direct control over road user charges. Government policy supports force account at national and district level, and the government has announced an intention to disband UNRA and transfer the responsibility for the management of roads back to the Ministry of Works.

In Tanzania, the road fund is one of the most progressive in Africa and provides an example of good practice. TARURA was established in 2017 to oversee local authority road agencies and district engineers are now only responsible for roads. Tanzania has benefitted from DFID long term technical assistance in the rural road sector. It implements a network management system for district roads known as DROMAS¹³.

Inadequate funding for road maintenance constrained some aspects of the GEM objectives but did not prevent some meaningful progress being made. GEM was not dependent on funds being available for maintenance, and GEM was able to make a positive contribution to identifying and resolving issues constraining effective road asset management. Workshops on the development of asset management policies were held in all participating countries (excluding the Western Cape) and the AM framework discussed in detail. The road agencies are well informed on the critical issues to be observed based on the six building blocks of the Road Preservation Pyramid.

The lack of funding for maintenance during the implementation period of the GEM project reduced opportunities for training and capacity building on the planning and organisation of road maintenance operations as the GEM advisers were not able to observe functional maintenance systems and make recommendations for appropriate improvements. As a result, the project initiated a process of investigating and proposing solutions to the perennial problem of maintenance funding shortages in the participating countries. A pilot meeting was held in Zambia with representatives of the key sector institutions to

¹³ District Road Management System.

understand the current situation. A diagnostic study was carried out on the existing mechanisms for funding maintenance in Zambia and the constraints faced, and to propose mechanisms and a process for resolving the constraints¹⁴. Tanzania experience was used in this study as an example of good practice in road fund management.

¹⁴ Refer to: Geddes, R.N. et al, Civil Design Solutions (2018). Economic Growth through Effective Road Asset Management (GEM), Quarterly Progress Report No. 6 (May to July 2018), Project No. 10636A GEN2018A, London: ReCAP for DFID. Chapter 5.

6 Monitoring of Social and Economic Indicators

6.1 Purpose of monitoring social and economic indicators

Socio-economic impact assessments were conducted in Chongwe Municipality (Zambia), Tonkolili District (Sierra Leone) and Kamuli District (Uganda), with two studies carried out under Kamuli District Council and one under the Uganda National Roads Authority (UNRA). Tanzania joined the project in 2018 and managed to carry out the baseline study.

The purpose of monitoring socio-economic impacts in the participating countries was to inform the GEM stakeholders of the extent to which maintenance interventions were contributing to the project purpose, i.e. achievement of economic and social benefits for local communities as a result of improved performance in road asset management. The results were expected to provide an evidence-base to influence policies and strategies for rural roads maintenance. In addition, they could be used for soliciting increased funding for maintenance, which was a great challenge during the implementation of the GEM project. The outcome of socio-economic impact studies, when disseminated in an easily understandable manner, can facilitate communication with local communities on rural roads maintenance and prepare them to take appropriate actions.

Development of socio-economic indicators under the GEM project was helpful in addressing the paucity of data for continuous monitoring and evaluation (M&E) of rural roads performance. Prior to the GEM project none of the participating countries collected socio-economic baseline data for rural roads, yet this is very important to enable effective M&E and to inform planning processes. Thus, the GEM interventions have been instrumental in strengthening data collection capacities for rural roads and addressing gaps in the data. Guidance on the monitoring of socio-economic impacts of road maintenance is provided in the GEM “Rural Road Asset Management Practitioners’ Guideline” (2019).

It is worth noting that while there have been many rural road investment impact studies, impact studies on road maintenance have rarely been done systematically. This is mainly due to the following reasons:

- the difficulty of identifying benefits from preventative maintenance;
- the short-term nature of some routine maintenance;
- the wide range of tasks (involving very different use of resources) which can be undertaken in maintenance, which makes comparisons over time and between roads difficult;
- virtually all roads receive some maintenance, (even if it is just emergency maintenance) and it is not ethical to provide no maintenance in order to carry out a comparative study; and
- in most instances, maintenance effects are likely to have a very small impact on transport costs, and consequently a much smaller effect on commodity prices or economic activity.

Transport sector investments are much more likely to be the subject of road impact studies than maintenance due to its larger identifiable effect on transport costs and operations.

6.2 Development of the indicators

The objective of the GEM socio-economic component was to develop simple indicators of economic and social impacts of rural road asset management and to monitor them in the project areas. Relevant socio-economic indicators were determined during the design phase of the project in consultation with the participating countries. This was to ensure that the indicators can be practically applied by road agency engineers and officials, which may not have been the case with more sophisticated indicators for a comprehensive impact study. They included transport availability and cost, road safety, commodity prices, etc. as outlined in Table 11. Common indicators were applied in all participating countries. Discussions on the indicators and their meaning were carried out during the GEM advisory visits to the countries. The process was very useful in improving the awareness of rural roads agencies of the possible impacts of road maintenance on the wellbeing of communities.

The type and scope of indicators was determined based on resource availability (time, human resource capacity, funds). The unit of observation for measurement was the Trading Centre (TC), which are centres of economic activity identified within the zone of influence of the project roads prioritized for maintenance.

Table 11: Key recommended socio-economic indicators

Indicators	Units	Purpose
Average distance from the Trading Centre to the District Centre	km	To provide the length of road section under assessment
Average travel time from the Trading Centre to the District Centre (by dominant mode of transport)	Minutes	To provide some indication of road condition and maintenance
Road Closure: How many days of the year is the road closed due to rains?	Number	To determine the level of service
No. of private transport operators serving the Trading Centre (relative to population): <i>Light vehicle, bus, motorcycles, trucks/freight transport</i>	Number	To provide some indication of transport availability and road usage
No. of available trips to the District Centre per day: (relative to TC population): <i>Light vehicle, bus, motorcycles, trucks</i>	Number	Frequency of transport services – indication of mobility of passengers & goods
Fares on public transport to the District Centre: <i>Light vehicle, bus, motorcycles</i>	Currency/km	Indication of passenger transport efficiency
Cost of freight transport to the District Centre: <i>Light vehicle, motorcycle, truck</i>	Currency/km	Indication of freight transport efficiency
Prices of goods (imported & exported) in the Trading Centre: <i>Maize, rice, sugar, salt, soap, coffee, etc.</i>	Currency	Impact of transport on commodity prices
Agriculture: Price of main cash crop produce in the TC (per kg)	Currency	Impact of transport on agricultural local economy
Education: average time to reach the nearest school from the TC by different modes of transport	Minutes	Indication of the level of access to education services
Health: Average time to reach the nearest Health Centre from the TC by different modes of transport	Minutes	Indication of the level of access to health services
Road Safety - No. of accidents on the road serving the TC for past year	Number	To give some indication of how road users are impacted in terms of safety
Economic (non-farm) activities: No. of shops / kiosks in the TC	Number	Impact of transport on the local (non-farm) economic activities

6.3 Collecting field data on the indicators

A simple questionnaire (spreadsheet) was designed to enable collection of quantitative data in the field, focusing on ten trading centres in each project area. Quantitative information was also collected to enrich the data with illustrative stories on the impacts of rural roads to the local communities. Overall, the participating countries were able to apply the questionnaire satisfactorily. However, in all phases, enumerators faced time constraints in administering the questionnaires in the field due to inadequate budget allocation for data collection. About 6 to 7 people of different categories and gender (traders, transport operators, passengers, teachers, etc.) were interviewed in each TC. In most cases enumerators spent approximately half a day per TC including travelling and interviews. Ideally one day per TC would have resulted in more reliable and comprehensive data.

Figure 11 shows a group of Manasi women traders interviewed by the GEM country team during a visit to Sierra Leone in June 2018.

Figure 11: Manasi traders taking goods to Makoni market



The socio-economic data collection was undertaken in three phases: Baseline surveys – between October 2016 and February 2017; second comparative surveys – between September and November 2017; and third surveys – between September and November 2018. Tanzania conducted its baseline survey in September 2018. All surveys were fully funded by the participating countries despite budget constraints, particularly in Tonkolili District in Sierra Leone¹⁵.

Country visits were conducted by the GEM Advisory Team prior to the baseline survey to discuss the project purpose, survey instruments, field requirements, budget issues and stakeholder expectations. After the baseline survey, the GEM Rural Transport Economist undertook an advisory visit to Sierra Leone followed by joint visits to Uganda and Zambia in 2017, together with the Communication Expert to support the countries to prepare for the next surveys. This involved further detailed discussion on the indicators and other issues in relation to challenges faced during the implementation of the baseline survey. Enumerators were advised to try and validate the data in the field by cross-checking with respondents and amongst themselves before entering the data in the summary sheets. Attempts to verify the data after leaving the field were tedious and did not always yield good results. Prior cross-checks in the field would have minimized unnecessary errors and gaps in the data. This advice was given to the survey teams for the third round of data collection

The country teams were advised to maintain a record of the actual costs incurred for the data collection to better inform future planning, preparation of budget estimates and application of funds (locally) for subsequent surveys. However, apart from UNRA, this advice was not necessarily acted upon due to late confirmation of budget availability in all agencies.

6.4 Analysis of the field data

Data analysis involved cleaning the field data and compilation of data summaries in one spreadsheet for all ten trading centres in each country, with Uganda having two summaries. The analysis was based on a comparison of baseline results (before situation) with subsequent comparative surveys (after situation). This proved to be the most appropriate methodology to achieve the purpose of the GEM project. However, the method only allows for a narrow comparison of results and it was not possible to separate the road impacts from the general socio-economic changes that could have happened in the project areas without road maintenance or improvement interventions in the relatively short duration of the GEM project.

A simple statistical analysis was done using selected key indicators from the questionnaire in relation to the availability and cost of transport. The *average travel time* was used as an independent variable for comparison with other indicators. The assumption was that variations in transport services, costs and prices

¹⁵ The Sierra Leone Roads Authority (SLRA) eventually funded the data collection including the provision of support staff.

are depend on travel times. Travel time depends on the road condition, reflecting the level of maintenance on the roads linking to the ten TCs.

The analysis was simplified to enable the country teams to easily interpret the data, determine the implications of findings and draw useful conclusions as evidence-base for decision-making and policy influence on rural roads maintenance. It should be noted that none of the agencies apart from UNRA had the capacity to conduct statistical data analysis independently. At the sub-national road agency level, more time is needed for capacity building to obtain tangible results from the socio-economic surveys.

Selected survey results

- **The dominant mode of transport** for both freight and passengers in Kamuli (Uganda) and Tonkolili (Sierra Leone) is a motorcycle (boda-boda / okadas) due to availability, time saving and convenient door-to-door services. In Zambia light vehicles and animal drawn carts are used for passengers and freight transport, with less use of motorcycles.
- **Transport availability** does not always depend on the road condition. For example, in Kamuli District spot improvements were done on the roads to the Kiwungu, Nabulezi, Kagumba and Wandegeya TCs reducing respective average travel times between the 2017 and 2018 surveys. However, the number of freight trucks increased in all TCs irrespective of whether connecting roads were maintained or not. This was due to increased demand for sugarcane transportation and a bumper harvest of coffee across the district.
- **Transport fares and charges:** Road maintenance or improvement in some areas resulted in reduced fares. For example, there was a notable reduction in transport fares to Masanga TC (Sierra Leone) from Le 5,000 in 2016 to Le 3,000 in 2017 per passenger due to the road improvement, despite the fuel price increase from Le 3,750 to Le 6,000 in the same period. However, the amount of fuel price increase from Le 6,000 in 2017 to Le 8,000 in 2018 did not explain the sharp increase in fares from Le 3,000 to Le 10,000 per passenger in the same period, considering also that the road was in good condition. It shows that variations in fares and charges do not always depend on the average travel times or road condition but are influenced by other factors such as demand and fuel prices.
- In Kamuli District there was a general increase in freight costs from the 2016/17 survey to the 2018 survey that was attributed to the increase in fuel costs and increasing demand for sugarcane and coffee transportation rather than the road condition. Also, a schoolteacher (UNRA survey) revealed that a boda-boda charges UGX 6,000 for a short distance trip to school, with the rate increasing to about UGX 8,000 on a rainy day and UGX 20,000 at night. The high prices at night are due to the fact that there are many potholes on the road which the riders may not see and therefore there is a higher risk of accidents.
- **Prices of goods:** A general observation is that variations in the prices of goods in the TCs are more influenced by demand, seasons for locally produced items, middlemen, and in some cases price controls by governments rather than road conditions. For example, in Tonkolili District increases in prices were observed between the surveys even though there were improvements in five roads connecting to the TCs. A cup of rice increased from Le 1,000 in 2016, Le 1,200 in 2017 and to Le 1,500 in 2018. It is also worth noting that a significant component of the transport cost for locally produced food and cash crops may be attributable to the 'first mile' from the farm, rather than on the district road network.
- **Non-farm economic activities:** The opening up of new shops and kiosks in some areas is a clear indication of the positive socio-economic impacts of rural roads. In Sierra Leone, seven new stalls were established in Masanga TC in 2018 as a result of the road improvement and ongoing maintenance. Likewise, in Masombrie TC two shops and seven kiosks opened in 2018 due to the improvement of the road to the TC. But in other cases, variations in non-farm economic activities are not always influenced by the state of rural roads. For example, in the 2016–17 surveys in Kamuli there was an increase in the number of shops/kiosks in all TCs irrespective of inadequate maintenance on the project roads. In 2018 there was an increase of shops/kiosks in seven TCs, which was attributed to increased population due to the influx of labourers and people coming to hire land to grow sugarcane.

- **Maintenance:** Overall, the poor funding situation for maintenance of priority rural roads during the GEM project period, and the relatively short duration of the project, made it difficult for participating countries to detect measurable improvements in the socio-economic conditions of the local communities. Positive socio-economic outcomes were observed in some project areas, but these could not be directly attributed to the condition of project roads. It was observed that road conditions generally don't change significantly over short periods of time, even if there is no maintenance; and motorcycle taxis, the predominant mode of transport in most of the project areas, are less affected by road conditions than other modes. There is a need to further develop the impact assessment approach so that socio-economic effects related to road asset management can be isolated from other influences on the local economy. More detailed analysis of these issues is being carried out under the PhD programme supported by ReCAP as part of the GEM project (see Annex 5).

Qualitative impacts

- **A testimony from a woman trader:** Ruth Mbakire who owns a kiosk, shop and bicycle in Kiwungu TC in Kamuli District Uganda highly commended the improvement of Bulunda – Kakindu road (17km). She can now send a hired boda-boda to Kamuli town to buy her merchandize instead of riding there by herself on a bicycle. This allows her more time to take care of her three young children and her business. She also reported that there is more movement of people coming into the village since the road was improved, including casual labourers looking for work in sugarcane farms. As a result, she has been selling more of her merchandise that includes cooked food such as chips. In 2016 she had only a small kiosk, but as her business flourished, she managed to open a shop behind her kiosk in 2017. She intends to expand her business further to a third kiosk if the road condition remains stable.

Figure 12: Ruth Mbakire in her kiosk at Kiwungu TC



- **A testimony from a health worker:** “I use a boda-boda to get to work. It takes 30 minutes to get to work when the road has been graded, about 40 minutes when the road is poor and about an hour in the rainy season. At the flooded sections, boda-bodas have to be carried and people use canoes to get across. In March and April this year (2018) I failed to get to work for about 7 days because of the poor state of the road due to heavy rains.” *Susan, midwife living 15 km from the health centre in Uganda.*

Institutional Outcome: The introduction of the concept of socio-economic impact assessment of rural roads in the GEM participating countries has enabled appreciation of the importance of road maintenance. Lessons learned from the process have been transformative in helping engineers and technicians to look beyond the physical aspects of rural roads towards the overall benefits including the wellbeing of the local communities

and sector policies. All through the GEM project, effective communication with key stakeholders was promoted to improve their understanding of the socio-economic objectives of rural roads, thus contributing to the achievement of the GEM project purpose. The importance of effective communication was illustrated by a community in Kamuli District in Uganda which noted that works on the road to Bulopa TC omitted improvement of a problematic (rocky) area that was known to cause serious discomfort to pregnant women and other sick people travelling to a health centre. The lack of consultation marginalised the local community and undermined the success of the project.

6.5 Recommendations for future monitoring

The following recommendations arise from the implementation of the socio-economic studies under the GEM project:

- Community consultation is important in planning and prioritization of rural roads maintenance in order to avoid disparities in expectations and to improve the socio-economic outcomes.
- In order to scale-up the GEM socio-economic impact assessments effectively more engagement with Road Fund (RF) agencies should be sought in the participating countries. This will help to secure sustainable funding for impact assessments as well as to enhance monitoring and evaluation activities of RF agencies. It will also help in coordination and funding of impact assessments in the participating countries, thus improving the quality, availability and usefulness of data. The advantage of RF support is that they too have vested interests in measuring socio-economic impacts of maintenance investments as an indication of value for money. Moreover, the results of the monitoring will benefit RFs directly by providing a basis for lobbying for increased resources for rural roads. The involvement of RFs would be instrumental in encouraging ARMFA to become more involved in facilitating knowledge sharing and experience across the Sub-Saharan Africa countries, including promoting GEM initiatives. Thus, the process of engagement with RFs that was started by the GEM Advisory Team in 2017 needs to be followed-up so as not to lose the momentum.
- The involvement of UoB in the GEM socio-economic impact study provides an opportunity for deeper studies going beyond a single difference reflexive comparison. UoB could work with suitable (locally based) academic and research institutions to provide technical support and continue the GEM approaches.
- There is a need to strengthen local capacities for socio-economic impact assessments in the GEM participating countries. During the GEM advisory visits in 2018 all countries expressed the need for training of trainers as a way of replicating and scaling up the GEM project approach beyond the project areas. This will require commitment of additional resources from the countries and ReCAP or its successor.
- The socio-economic impacts of rural road maintenance are realised in the medium to long-term. Such impacts can only be sustained when maintenance is done on the network consistently over time. Hence for the GEM project to achieve its purpose, including achieving a clear understanding of the impact of road maintenance on community livelihoods, considerably more time is required.
- There is a need to devise an impact assessment approach that can isolate socio-economic effects related to road asset management from other influences on the local economy. The simplicity of the GEM approach has merit in providing an initial indication of impact and identifying priorities. However, to fully identify the impact of maintenance and asset management, controls for other factors will need to be in place (e.g. general economic trends, seasonal fluctuations in agricultural output, or fuel prices). This will inevitably require a more complex analysis that includes a framework for the matching of similar roads that subsequently received substantially different maintenance inputs at the same time.

7 Communication and Road Asset Management

7.1 Purpose of Communications

Good communication is a fundamental requirement for road asset management. The road agency must establish effective communication with policy makers in the local authority and national government, and with road users and local communities. Good communication can lead to greater support from the government for the construction, upgrading and maintenance of rural roads maintenance. At the community level, the communication and outreach activities of a road agency create awareness, promote a buy-in and embed an understanding of how rural roads impact on community livelihoods. Communication is required with road users on issues such as the appropriate level of service that can be provided on rural roads. By clearly communicating its strategies and plans to the public, a greater sense of responsibility and accountability is developed within the agency to deliver the plans. Good communication enables a healthy relationship between all parties.

7.2 Pilot Project in Zambia

Since the inception of the GEM project, district councils have improved in their engagement with stakeholders, including road users, communities and the funding authorities. However, it was realised that a more strategic approach was required for road agencies to ensure that effective communication is achieved with all stakeholders. In particular, the higher-level decision makers in the government (Permanent Secretary and Ministerial level) needed to be engaged in order to influence a shift in policy in allocation of resources for rural roads. This realisation resulted in the implementation of pilot activities in Chongwe district in Zambia to improve their external communications.

The purpose of the pilot study was to investigate how improved communications using different media platforms can be used to increase awareness at different stakeholder levels, and influence perceptions related to the importance of rural roads and their maintenance. Media that would be considered as part of a strategic communication plan included traditional print media, radio and television and social media platforms.

The External Communications component was closely linked to the socio-economic studies being carried out in the participating countries. Roads agencies can package the findings of their socio-economic surveys in a way that the findings are brought to the attention of decision makers at the local and national levels and clearly understood.

The pilot study was implemented in Chongwe District of Zambia. The Zambia Road Development Agency (RDA) provided support to the district to develop a communications strategy and a programme of communication activities. The GEM Communications Expert provided support to RDA and the Council on the identification of appropriate material to be disseminated through the communications activities.

7.3 Findings of the Pilot Study

The following are the findings of the pilot study in Zambia:

- The National Road Fund Agency (NRFA), RDA and Chongwe Municipality have structures within their organisational set up that are charged with running the communications function. However, these structures suffer from severe shortage of funding and skilled staff. The Ministry of Local Government and Housing (MLG) currently does not have a functioning communications division although the need for one has been recognised and efforts are being made to address the situation.
- Technical staff in the Council were not providing routine reports on progress with the maintenance programme to the NRFA and MLG. Inadequate communication at the technical level contributes to lack of confidence in the management of the local road agency and may deter any increase in the allocation of maintenance funds.
- Effective communication is severely hampered where there is political interference. Conditions are required where all parties embrace open communication, but the pilot in Chongwe showed that this

is not necessarily the reality on ground. Officials in the RDA and at district level were cautious about allowing external communication to take place and in some cases prevented it.

- Effective communication can be hindered by mismanagement in the institution. The Chongwe Municipality Public Relations Officer complained of misuse of funds in the council that saw the communication department with no funds at all to implement a communication strategy. The department was prevented by the senior management from participating in a radio programme that would talk of the importance of maintaining roads, as the council had only maintained two roads and the community was angry. Meanwhile the council had bought a new vehicle with money believed to be for road maintenance.
- Progress with the pilot study was affected by unforeseen events. During the August 2018 visit by the GEM Adviser, when the communication activities were meant to kick-off, the RDA had a new Communication Director who had no knowledge of the GEM project. The project had to be re-introduced and the ideas discussed in previous meetings repeated. This slowed down the component as its goal to implement the strategies during the August visit could not be achieved. Significantly more time was needed for the pilot study to achieve meaningful results.
- Despite the constraints and disruption, Chongwe Municipality made progress in understanding their shortcomings in communicating on roads issues including the need to prepare and implement a comprehensive communication strategy. More interaction is required with the Chongwe Town Clerk to ensure a clear understanding of the importance of the communication department and therefore to provide support. Timely and efficient reporting at the technical level by the Director of Engineering might result in an improve flow of maintenance funds to the district.

Lessons learned from the pilot communications activities in Chongwe have been used to develop guidelines for external communications which are included the GEM “Rural Road Asset Management Practitioners’ Guideline” (2019).

8 Attainment of the Project Objectives and the Future of GEM

8.1 Project Objectives

The objectives of the project have been achieved in the period since the commencement of the implementation phase in July 2016. Achievement of the project purpose, “to achieve economic and social benefits for local communities as a result of improved performance in road asset management”, was constrained by factors beyond the control of the project, including the short time frame.

The following is a summary of project achievements against the objectives (see Section 1.3):

- 1 The literature review (Objective 1) was reported in the Final Formulation Phase Report (May 2016). The findings included:
 - When African countries gained independence in the late 1950s and 1960s there was a need to increase the road networks to support national development. Unfortunately, this expansion of the network did not take into account the limitation of national governments to sustain the recurrent maintenance requirements. A large proportion of the investment was lost.
 - Institutional reforms implemented under the Road Management Initiative (RMI) resulted in the establishment of road maintenance funds in many countries and semi-autonomous roads authorities. This resulted in improved maintenance of national roads but less impact at a sub-national level on rural road networks. Funding for maintenance continues to be inadequate and there are severe capacity constraints in roads agencies and the private sector.
- 2 The GEM data collection tools (Objectives 2-4) are well developed, understood by the users and are being applied in the project areas. They are relatively easy to apply in new areas with some basic training. The project design lends itself to roll out on a large scale.
- 3 The GEM specification for rural road asset management enables road agencies to evaluate their performance in asset management as a basis for self-improvement. This GEM asset management specification was based on ISO50001 asset management specification and was developed through close involvement with local road agencies and is based on the six building blocks for effective road asset preservation illustrated in the Road Preservation Pyramid (Figure 1). The specification allows roads agencies to calculate the “Road Sector Sustainability Index (RSSI)”, which is an objectively determinable index based on the extent to which the requirements of the six building blocks are satisfied in practice. A road infrastructure score card system has also been developed for communicating the outcome of the self-assessment to non-technical stakeholders.
- 4 Each participating road agency now has an inventory of their road network, a condition assessment and indication of the network asset value (Objective 5). All road agencies except UNRA and TARURA have now extended the road condition assessment methods to their entire networks.
- 5 Road agency staff have grown in stature and self-confidence due to participation in the project and there is a strong demand for expansion of the project to new districts. In Sierra Leone there was a request for short-term assistance for training with the view to expand the project to cover all 13 districts in the country possibly with Road Fund assistance. In Zambia, the GEM approaches have been shared with districts neighbouring Chongwe under their own initiative. In Uganda, there is a demand to implement the GEM approaches in districts adjoining Kamuli.
- 6 There is an increase in awareness in the participating agencies of the importance of adopting a holistic approach to road asset management, including effective national and local level policies for rural roads and political support for the sector. The agencies have increased awareness of the importance of consulting with local communities and road user groups (Objective 5). Stakeholder involvement has been identified as key to the successful provision and maintenance of rural roads in all of the participating countries. However, more work needs to be done on developing effective and sustainable external communications.

- 7 The performance evaluation process enables road agencies to identify gaps in their performance and develop action plans to close the gaps. For example, new policies for rural roads have been drafted and are in the process of adoption in the participating districts in Uganda, Sierra Leone and Zambia (Objective 5).
- 8 The participating countries have made significant contributions to the project by funding the field data collection and providing in-country support to the CDS GEM Advisory Team.
- 9 The GEM project contributed to several regional and international events. Four technical papers submitted to the SARE/IRF/PIARC Regional Conference for Africa in Durban in October 2018. Further dissemination of the project achievements will be achieved through participation in the ReCAP Inter-Regional Implementation Meeting in Kathmandu in February 2019, the 9th Africa Transportation Technology Transfer Conference in Maputo in August 2019, the 12th TRB International Conference on Low Volume Roads in Kalispell, Montana, USA, in September 2019 and the PIARC World Road Congress in Abu Dhabi in October 2019.
- 10 The GEM project provided a platform for two PhD degree study programmes at the University of Birmingham¹⁶.
- 11 The tools for assessment of performance and the methodology for using them are described in the GEM “Rural Road Asset Management Practitioners’ Guideline” (2019).

8.2 Log Frame

During the Formulation Phase of the GEM project an assessment was made of the likely contribution of the project to the ReCAP log frame indicators. This assessment is summarized in the table in Annex 4 with an assessment of actual achievement against each indicator. Most of the targets were achieved, but the impact on road maintenance (Outcome Indicator 2) was not as significant as expected due to the lack of funding for maintenance at the district level.

8.3 The Future of GEM

The constraints faced by rural road agencies include weak policies for funding of rural roads, inadequate allocation of funds for road maintenance and weak capacity in rural roads agencies. They are deep-seated, and progress in addressing them is slow. However, the GEM methodology provides a means of moving forward by empowering agency staff, providing data as a basis for decision making, identifying action plans to address shortcomings in RAM, and improving communication with policy makers, road users and communities. The GEM tools are easily understood and implemented by agency staff. The GEM methodology is repeatable and lends itself to rollout both in the current participating countries and to other countries in the region. The rollout could include the option of institutionalising the GEM methods and tools in engineering institutions or other private sector bodies.

Indications are that individuals that have benefitted from participation in GEM will continue to use the GEM tools and approaches after the closure of the project. This will have long term positive impact on RAM. The project has created potential champions of RAM good practice in the participating countries. In Zambia and Uganda, the participating districts have already started to support the implementation of the GEM approaches in neighbouring districts. In general, participating agencies have developed high expectations from the project, not for any material support, but for soft technical assistance that will assist them build internal capacity to promote RAM approaches in their countries. This could be achieved by targeted train-the-trainer sessions in the participating countries as the project draws to a close.

It has been suggested that the Association of Road Maintenance Funds in Africa (ARMFA) could become the coordinator of a GEM project rolled out on a wide basis in Africa. Discussions on this issue with ARMFA representatives have been positive, but ARMFA currently lacks capacity and resources to manage a project of this nature. ARMFA would need to establish an operational mechanism to manage roll-out of GEM, which

¹⁶ Progress with the PhD studies by March 2019 is summarised in Annex 5.

could be done with support from ReCAP as a strategic partner¹⁷. It is evident that further expansion of GEM on a large scale is only possible with support through a programme such as ReCAP.

¹⁷ In the meantime, ARMFA has accepted, in principle, the responsibility of ownership of the GEM Rural Road Asset Management Practitioners' Guideline, amongst others. This will be formalised in an MoU to be signed between Cardno/ReCAP and ARMFA (source: ReCAP PMU).

9 References

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4. Committee of Transport Officials. TMH 9: Standard Visual Assessment Manual. Pretoria, South Africa, 2013.
5. Committee of Transport Officials. TMH 22 (draft): Road Asset Management Manual. Pretoria, South Africa, 2013.

Annex 1 Schedule of Project Management Meetings

Date	Venue	Present	Purpose and Issues Discussed
9 th November 2015	Cardno offices, London.	Gerome Rich (ReCAP) Jasper Cook (ReCAP) Les Sampson (ReCAP) Bernard Obika (RI) Simon Gillett (RI) Michael Burrow (UoB)	<ul style="list-style-type: none"> ▪ Launch of the project. ▪ Key dates. ▪ Client expectations.
23 rd November 2015	WYG offices, Pretoria	Les Sampson (ReCAP) Nkululeko Leta (ReCAP) Simon Gillett (RI) Robert Geddes (RI/CDS) Liezl Coetzee (RI) Michael Pinard (RI) Michael Burrow (UoB)	<ul style="list-style-type: none"> ▪ The revised approach and methodology proposed by RI. ▪ The strategy for selecting the participating countries.
11 th and 12 th February 2016.	Protea Hotel Courtyard in Dar es Salaam.	Nkululeko Leta (ReCAP) R Geddes (RI/CDS) M Pinard (RI) M Burrow (UoB) Camilla Lema (RI) Charles Bopoto (RI/CDS) Kingstone Gongera (RI/CDS) Gerrie van Zyl (RI) Dr Magafu (PO-RALG) Abdul Awadh (local consultant)	<ul style="list-style-type: none"> ▪ Road maintenance in Tanzania; ▪ Lessons learned from Western Cape and Namibia road network management; ▪ Initial proposals for each component of the project; and ▪ Identification and selection of participating road agencies.
6 th and 7 th July 2016	City Lodge Hotel, Hatfield, Pretoria.	L Sampson (ReCAP) S Gillett (RI) R Geddes (RI/CDS) C Bopoto (RI/CDS) K Gongera (RI/CDS) C Lema (RI) M Burrow (UoB) M Pinard (RI) G van Zyl (RI) Aziz Kamal (Sierra Leone) Mark Rubarenzya (Uganda) Joseph Goma (Zambia) Andre van der Gryp (W. Cape) Peter Kome (Sierra Leone/UoB) Robert Kakiiza (Uganda/UoB) Dickson Ndhlovu (Zambia/UoB)	<p>Project Launch Meeting marking the start of the Implementation Phase.</p> <ul style="list-style-type: none"> ▪ Project objectives, monitoring tools and self-assessment questionnaire; ▪ Selection of project areas within the participating countries; ▪ Topics for UoB PhD theses; and ▪ Next steps for the project implementation.
1 st and 2 nd August 2017	City Lodge Johannesburg airport.	Les Sampson (ReCAP) Nkululeko Leta (part) (ReCAP) Camilla Lema (CDS) Charles Bopoto (CDS) Gerrie van Zyl (CDS) Grace Muhia (CDS) Kingstone Gongera (CDS) Mike Pinard (CDS) Robert Geddes (CDS)	All aspects of the project implementation were discussed.

Date	Venue	Present	Purpose and Issues Discussed
26 th and 27 th February 2018	CSRI, Pretoria	Les Sampson (ReCAP) Jasper Cook (ReCAP) Nkululeko Leta (ReCAP) Benoit Verhaeghe (CSIR) Phil Paige-Green (CSIR) Robin Workman (TRL) Robert Geddes (CDS)	Meeting of Team Leaders from three AfCAP regional projects to discuss synergies and linkages between the projects.
10 th October 2018	Durban International Conference Centre	Dave Runganaikaloo (ReCAP) Annabel Bradbury (ReCAP) Nkululeko Leta (ReCAP) Jasper Cook (ReCAP-TP ¹⁸) Michael Burrow (UoB) Michael Pinard (CDS) Charles Bopoto (CDS) Kingstone Gongera (CDS) Robert Geddes (CDS)	Discussion on the current status of the GEM project. A written summary of the project was requested and submitted to ReCAP PMU on 22 nd October 2018.

¹⁸ Technical Panel

Annex 2 Summary of Country Visits

Date	Venue	Present	Purpose
13 th Jan 2016	Western Cape Department of Transport and Public Works, Cape Town.	Les Sampson (ReCAP); Richard Hutton (W. Cape); Mervyn Henderson (WC); Andre van der Gryp (WC); Azni November (WC); Robert Geddes (RI/CDS); Liezl Coetzee (RI); Mike Pinard (RI); Charles Bopoto (RI/CDS)	To discuss the participation of the Western Cape in the project as an example of good practice in road asset management.
17 th to 28 th July 2016	Zambia, Uganda, and Sierra Leone	Rob Geddes (RI/CDS); Kingstone Gongera (RI/CDS) Representatives of national and district road agencies, road funds and local authorities.	<ul style="list-style-type: none"> ▪ Meet key stakeholders at national and local levels and discuss the project objectives and research methodology; ▪ Confirm the selected project areas and project road network in each country; ▪ Discuss the data collection requirements for the project areas including the self-assessment questionnaire and refine the data collection tools; and ▪ Prepare an action plan for each country with clear deliverables, target dates and responsibilities.
15 th August to 9 th Sept 2016	Zambia, Uganda, and Sierra Leone	Charles Bopoto and local partner representatives	To provide training in collection of the road inventory and road condition data.
29 th Oct and 12 th Nov 2016	Sierra Leone, Zambia and Uganda	Kingstone Gongera and local partner representatives.	<ul style="list-style-type: none"> ▪ Confirm the selected road network within each district and prepare a map; ▪ Discuss responses to the self-assessment questionnaire and clarify any queries; ▪ Assist the countries to prepare action plans based on the needs assessment and capacity gaps identified through the self-assessment; and ▪ Assist the countries to prepare for the first PIT meeting.
17 th to 31 st Jan 2017	Sierra Leone, Zambia and Uganda	Charles Bopoto, Kingstone Gongera, Camilla Lema and local partner representatives.	<ul style="list-style-type: none"> ▪ Finalize the baseline data for the road inventory, road condition surveys and the socio-economic data; ▪ Assist the road agencies to develop their 2017 work plan on roads selected for the GEM project; and ▪ Identify gaps in technical capacities and plan for further training.
7 th to 31 st March 2017	Sierra Leone, Zambia and Uganda	Charles Bopoto, Kingstone Gongera and local partner representatives.	<ul style="list-style-type: none"> ▪ Identify the gaps in the baseline data collected by participating countries and review the responses to the questionnaire with the country teams; ▪ Discuss and develop the Uganda project approach which included data from the district and national road agencies; ▪ Assist the road agencies to draw up action plans for 2017; and ▪ Assist the participating countries in formulating Asset Management Policy Frameworks.

Date	Venue	Present	Purpose
15 th to 21 st May 2017	Uganda	Kingstone Gongera, Charles Bopoto and local partner representatives.	The visit followed a decision by ReCAP management to include UNRA in the GEM project as a separate road agency. The objectives were to: <ul style="list-style-type: none"> ▪ Undertake a mini workshop on Asset Management with UNRA staff; ▪ Identify any gaps in baseline data collected by UNRA; ▪ Review the responses to the AM self-assessment questionnaire with the UNRA team; and ▪ Assist UNRA to draw up an Action Plan for 2017.
3 rd to 7 th July 2017	Uganda	Camilla Lema, Grace Muhia and local partner representatives.	<ul style="list-style-type: none"> ▪ Conclude the socioeconomic baseline data and launch preparations for repeat surveys for 2017; ▪ Discuss the baseline indicators, data summaries and preliminary analysis with UNRA and Kamuli District; and ▪ Identify issues concerning communication by Kamuli District and UNRA regarding their road management policies and plans.
3 rd to 8 th August 2017	Zambia and Sierra Leone	Camilla Lema and local partner representatives.	Assist road authority and district to prepare for the survey planned in September 2017 including: <ul style="list-style-type: none"> ▪ Update on socio-economic baseline data; ▪ Discuss the results and preliminary analysis of the baseline data; ▪ Discuss the indicators to ensure thorough understanding by the enumerators; ▪ Plan for the repeat survey; and ▪ Carry out a field visit to trading centres and project roads.
21 st August to 1 st Sept 2017	Zambia, Uganda and Sierra Leone	Charles Bopoto and local partner representatives.	<ul style="list-style-type: none"> ▪ Review and validate the 2016 baseline data; ▪ Re-value the road assets as at 2016; ▪ Review the condition survey forms in preparation for the 2017 surveys; ▪ Refresh the country team members on data collection methods; ▪ Carry out field visit to self-calibrate team members on assignment of Degree & Extent values, etc; and ▪ Update GEM Project country action plans.
3 rd to 15 th Sept 2017	Zambia and Uganda	Kingstone Gongera and local partner representatives.	<ul style="list-style-type: none"> ▪ Introduce the revised self-assessment questionnaire for the second round of assessment; ▪ Provide clarification on responses to sections of the questionnaire; ▪ Update GEM country work plans; and ▪ Assist country representatives in preparations for the 2017 PIT meeting.
16 th to 20 th Oct 2017	Tanzania	Charles Bopoto and local partner representatives.	<ul style="list-style-type: none"> ▪ Present an overview of the GEM Project and AM assessment procedures to TARURA and Kilindi district staff;

Date	Venue	Present	Purpose
			<ul style="list-style-type: none"> Assist Kilindi district to update the AM self-assessment status and discuss the results; Present GEM's procedures for Road Condition Assessment and Asset Valuation; and Assist the district to identify AM gaps and prepare mitigation plans.
4 th to 14 th Dec 2017	Tanzania (Mwanza and Dar es Salaam)	Charles Bopoto and local partner representatives.	<p>To conduct workshops in Mwanza and Dar es Salaam to present and discuss:</p> <ul style="list-style-type: none"> The RAM Self-Assessment tool, including assisting the participants to undertake a process of self-assessment; Identification of AM gaps preparation of preliminary mitigation plans; The Road Condition Assessment and Asset Valuation tool; and The measurement of socio-economic impacts of maintenance interventions on the road networks.
17 th to 19 th Dec 2017	Zambia	Camilla Lema, Grace Muhia and local partner representatives.	<ul style="list-style-type: none"> To meet key stakeholders in the road sector at national and district level; To understand the status of existing communications activities in the road sector; To visit a selection of rural roads and trading centres; and To prepare initial proposals for a district communication strategy.
3 rd to 10 th Feb 2018	Sierra Leone	Charles Bopoto and local partner representatives.	<ul style="list-style-type: none"> Review and validate the 2017 data on road condition and run the 2017 condition data analysis, and re-value the road assets as at the end of 2017; Extend the data collection exercise and analysis to the entire road network in Tonkolili; Introduce new country team members to the data collection and analysis methods as well the Road Asset Management Assessment; and Update the GEM Project country work plans.
27 th Feb to 2 nd March 2018	Zambia	Camilla Lema, Grace Muhia and local partner representatives.	<ul style="list-style-type: none"> Detailed review of the socio-economic repeat survey data and discussion of the preliminary analysis of the results; Review and clarification of the communication tools with the district; Field visit to a trading centre and road earmarked for maintenance; Consultative meeting with the Road Fund on M&E issues and maintenance financing; and Identification of the next steps and timing for the implementation of socio-economic and communications components in Chongwe Municipality.
19 th to 27 th March 2018.	Uganda and Zambia	Charles Bopoto and local partner representatives.	<ul style="list-style-type: none"> Review and validate the 2017 data on road condition, run the 2017 condition data analysis and re-value the road assets as at the end of 2017; Extend the data collection exercise and analysis to the entire road network in the district;

Date	Venue	Present	Purpose
			<ul style="list-style-type: none"> Introduce new country team members to the data collection and analysis methods as well the Road Asset Management Assessment; and Update the GEM Project country work plans.
19 th to 23 rd March 2018	Zambia	Kingstone Gongera and local partner representatives.	<ul style="list-style-type: none"> Assist Chongwe district to make use of the data and information collected under the project to make sound management decisions; Analyse the asset value trends in the two years of the GEM project and deduce the cost of remedial works based on the data available in the road condition survey reports; and Discuss funding of maintenance with Ministry of Local Government and RDA.
28 th March 2018	Zambia	Nkululeko Leta, Robert Geddes, Charles Bopoto, Kingstone Gongera, Michael Pinard, Joseph Haule and local partner representatives.	Assist ReCAP management and their consultants to understand existing mechanisms for funding maintenance in Zambia and the constraints faced, and to initiate a process for resolving the constraints through ReCAP support and the GEM project.
4 th to 8 th June 2018	Sierra Leone	Camilla Lema and local partner representatives.	<ul style="list-style-type: none"> Follow-up on progress with the implementation of socio-economic component in Tonkolili District including the repeat survey results, the timing and resources needed for the next survey and the identification of possible challenges; Meeting with RMFA in Freetown on monitoring and evaluation of rural road maintenance in Sierra Leone; and Visit to a trading centre and project road.
23 rd to 28 th July 2018	Zambia	Joseph Haule	Scoping study of issues concerning the financing of rural road maintenance in Zambia including meetings with all key sector stakeholders and review of relevant road sector legislation and other documents.
23 rd to 28 th July 2018	Uganda	Nkululeko Leta, Camilla Lema, Charles Bopoto, Kingstone Gongera, Robert Geddes and local partner representatives.	<ul style="list-style-type: none"> Follow-up on the progress in the implementation of socio-economic component of the GEM project in Uganda focusing on the repeat survey results for UNRA and Kamuli District; Discussions with UNRA and the district administration on the status of the GEM project activities and overall road asset management issues in the project area; Obtain an understanding of funding issues for maintenance through a meeting with the Road Fund. Update the GEM work plan including preparations for the 2018 PIT meeting; and Visit to a trading centre and project road.
5 th to 9 th August 2018	Tanzania	Nkululeko Leta, Camilla Lema, Charles Bopoto and local partner representatives.	To provide training on road condition assessment and asset valuation, and socio-economic data collection.

Date	Venue	Present	Purpose
13 th to 17 th August 2018	Zambia	Grace Muhia, Charles Bopoto and local partner representatives.	To follow up on progress with the implementation of communications activities including: <ul style="list-style-type: none"> ▪ Meetings with stakeholders including RDA, NRFA, MLG and Chongwe Municipal Council; ▪ Visit to the Chongwe Community Radio station; and ▪ Field visit to a project road.
29 th Oct to 3 rd Sept 2018	Tanzania	Charles Bopoto and local partner representatives.	To assist the Tanzania team to prepare for the PIT meeting.

Annex 3 Project Reports

Formulation Phase

Title	Date	Purpose and Contents
Mobilisation Report	December 2015	<ul style="list-style-type: none"> ▪ Summary of meetings held with the ReCAP PMU. ▪ Proposed revised approach and methodology. ▪ Actions to be carried out in the Inception and Formulation Phases. ▪ Strategy for selection of the participating countries. ▪ Changes to the Advisory Team.
Inception Report	February 2016	<ul style="list-style-type: none"> ▪ Review of rural road asset management (RAM) in sub-Saharan Africa. ▪ Initial recommendations for the development of tools for measuring performance in RAM. ▪ Identification of participating countries including questionnaire on existing road management arrangements. ▪ Likely contribution of the project to the ReCAP Log Frame performance indicators.
Mombasa Workshop Report	April 2016	Report of GEM workshop held at the conference.
Final Formulation Phase Report (Design Report)	May 2016	<p>Findings and recommendations of the Formulation Phase including:</p> <ul style="list-style-type: none"> ▪ Project purpose, objectives and approach; ▪ Review of existing rural roads asset management in Africa; ▪ Framework for self-assessment of asset management performance; ▪ Road network asset valuation and road condition monitoring; ▪ Indicators of social and economic impacts of rural roads; ▪ Methodology for technical assistance to the participating roads agencies; ▪ Evaluation of proposals submitted by countries and options for country selection; ▪ Project management arrangements and make-up of Advisory Team; ▪ Work Plan for the Implementation Phase; ▪ Monitoring and evaluation (Log Frame indicators and targets); ▪ Report on Dar es Salaam meeting; and ▪ Report on Mombasa workshop.

Implementation Phase

Title	Date	Purpose and Contents
Inception Report for Implementation Phase	September 2016	Summary of activities carried out in the first month of the project implementation and activities planned activities for the next phase of the project implementation.

Title	Date	Purpose and Contents
		<ul style="list-style-type: none"> ▪ Background to the project, purpose, objectives and approach; ▪ Project Launch Meeting; ▪ Data Collection Instruments (Self-assessment questionnaire, road inventory and condition forms and social and economic indicators); ▪ Project Information Leaflet; ▪ Report on the initial visit to Zambia, Uganda and Sierra Leone including the status of rural road asset management in each country; ▪ Project management arrangements; and ▪ Work plan for the Implementation Phase.
Mobilisation Report for Implementation Phase	October 2016	<p>Report on the re-mobilisation of project activities in October 2016 following assignment of the management of the project to Civil Design Solutions (CDS) including:</p> <ul style="list-style-type: none"> ▪ Report on visit to Uganda, Zambia and Sierra Leone from 15th August to 9th September 2016; ▪ Progress in the participating countries with collecting the baseline data; ▪ Updated workplan and time inputs by each member of the technical assistance team; and ▪ Next steps for the project implementation.
Report on the PIT Meeting November 2016	December 2016	<ul style="list-style-type: none"> ▪ Report on all aspects of the meeting as listed in Table 2. ▪ Report on the visit to Sierra Leone, Zambia and Uganda by the GEM Road Maintenance Adviser in October/November 2016.
Baseline Study Report	April 2017	<p>Report on the baseline status in the project areas (Chongwe - Zambia, Kamuli - Uganda, Tonkolili - Sierra Leone and Overberg - Western Cape) relative to the GEM asset management framework including the self-assessment of performance and socio-economic indicators. Initial comparisons were made between the performance of the participating road agencies.</p>
First Quarterly Progress Report	May 2017	<p>Summary of activities undertaken, and progress achieved from January to April 2017 including:</p> <ul style="list-style-type: none"> ▪ Visit to the three participating countries in January and March 2017; and ▪ Collection and analysis of baseline data.
Second Quarterly Progress Report	August 2017	<p>Summary of activities undertaken, and progress achieved from May to July 2017 including:</p> <ul style="list-style-type: none"> ▪ GEM workshop at Technology Transfer Conference in Livingstone, Zambia, on 9th May 2017; ▪ Country visits to Uganda for UNRA AM self-assessment and Action Plan; ▪ Development of GEM Asset Management and Road Preservation Indices; ▪ Preliminary analysis of socio-economic analysis of data collected in rural trading centres in Uganda; ▪ Lecture by Kingstone Gongera at the Senior Roads Executive Course at University of Birmingham on Road Asset Management; ▪ Visit to Uganda to review the socio-economic indicators and prepare for the second round of data collection; and ▪ Visit to Uganda to identify issues concerning External Communications for rural roads agencies.
Consolidated Baseline Study Report	August 2017	<p>Incorporation of data from the Uganda National Road Authority (UNRA) in the baseline and inclusion of data on the road inventory and condition of the GEM road network in each project area.</p>

Title	Date	Purpose and Contents
Third Quarterly Progress Report	November 2017	<p>Summary of activities undertaken, and progress achieved in the period August to October 2017 including:</p> <ul style="list-style-type: none"> ▪ Team Meeting in Johannesburg on 1st and 2nd August 2017; ▪ Visit by the Rural Transport Economist to Zambia and Sierra Leone; ▪ Visits by the Road Condition Monitoring Expert to Zambia, Uganda, Sierra Leone and Tanzania; ▪ Visit by the Road Maintenance Expert to Zambia and Uganda; and ▪ Progress report by the two UoB PhD candidates that are using the GEM project for their research projects.
Report on 2017 RAM Assessment Support Visits to TARURA, Tanzania	January 2018	<p>Summary of activities carried out by the Road Condition Monitoring Expert on visits to Tanzania in October and December 2017, including options and recommendations for inclusion of Tanzania in the GEM project.</p>
Fourth Quarterly Progress Report	February 2018	<p>Summary of activities undertaken, and progress achieved in the period November 2017 to January 2018 including:</p> <ul style="list-style-type: none"> ▪ Visit of Road Condition Monitoring Expert to Tanzania; ▪ Visit of Rural Transport Economist and Communications Expert to Zambia; ▪ Participation of the GEM Advisory Team in the ReCAP IRIM in Uganda; ▪ GEM Project Implementation Team held during the IRIM; ▪ Piloting the Communication Component in Zambia's Chongwe Municipality; ▪ Summary of funding issues that were constraining progress with the road maintenance component of the project; ▪ Summary of GEM Indicators of Performance in Rural Roads Asset Management; and ▪ Progress report by the two UoB PhD candidates that are using the GEM project for their research projects.
Fifth Quarterly Progress Report	August 2018	<p>Summary of activities carried out in the period from February to April 2018 including:</p> <ul style="list-style-type: none"> ▪ Status in road asset management in the project areas at end of 2017 relative to the baseline established in 2016; ▪ Visit to Zambia for the Socio-Economic and External Communications Component; ▪ Visits of the Road Condition Monitoring Expert to Sierra Leone, Uganda and Zambia; ▪ Visit of the Road Maintenance Expert to Zambia; ▪ Meeting in Lusaka to discuss funding issues for roads in Zambia; and ▪ Progress report by the two UoB PhD candidates.
Sixth Quarterly Progress Report	October 2018	<p>Summary of activities carried out in the period from May to July 2018 including:</p> <ul style="list-style-type: none"> ▪ Visit of the Rural Transport Economist to Sierra Leone and Uganda; ▪ Visit of the Team Leader, Road Maintenance Expert and Road Condition Monitoring Expert to Uganda and update on road asset management issues in Uganda; ▪ Visit of the Africa Road Financing Expert to Zambia and analysis of rural road maintenance financing issues in Zambia; and ▪ Progress report by the two UoB PhD candidates.
Report on Communications Expert Visit to Zambia	August 2018	<p>Summary of activities carried out on the visit, and findings and recommendations for the communications component.</p>

Title	Date	Purpose and Contents
Report on GEM Support Visit to Tanzania	September 2018	Summary of activities carried out on the first of two support visits to Tanzania including training on road condition assessment and asset valuation and socio-economic data collection.
Monthly Progress Reports for December 2016 to September 2018	End of the respective month	Summary of month's activities and plans for the next month.
Dissemination Workshop Report	November 2018	Report on the GEM participation in the PIARC/SARF/IRF Regional Conference in Durban in October 2018 and the PIT meeting held in Lusaka in November 2018.
Draft Final Report	31 January 2019	Summary of project activities, outputs and achievement and the way forward.
Final Report	26 March 2019	Summary of project activities, outputs and achievement and the way forward.
Rural Road Asset Management Practitioners' Guideline	July 2019	The purpose of the guideline is to provide the tools needed by rural road agencies to assess and improve their performance in road asset management. It guides users in the process of adopting and implementing asset management approaches to the delivery of road networks and assists rural road agencies in obtaining support from political representatives and senior decision makers. Tools are provided for the road agency performance self-assessment, developing asset management policies and road maintenance strategies, undertaking road condition surveys and asset valuation, and planning and implementing maintenance works.

Annex 4 Summary of Log Frame Indicators, Targets and Achievement

INDICATOR	Milestone 1 (July 2016)	Milestone 2 (July 2017)	Milestone 3 (July 2018)	Assumptions	Achievement November 2018
Outcome Indicator 1					
SUSTAINABILITY: Partner Government and other financiers co-funding research with ReCAP. Contribution in kind (K) relates to funding of trial sections, staff time, to funding of research program core costs, research contracts, dissemination, training. Core contributions (C) relate to capacity building and knowledge management.	K = £10,000	K = £20,000	K = £30,000	Participating countries allocate two staff-months per annum to data collection plus vehicle and allowances	Significant contribution of partner governments including staff time and local transport.
	C = 0	C = 0	C = 0		Clarification required on how this indicator is measured.
Outcome Indicator 2					
Concrete examples of change (applied or formally adopted), influenced by ReCAP research that will be applied to km of road in focus countries. Note: km of road lifespan of ReCAP influenced incorporates road programmes that are planned and designed based on ReCAP guidelines. Implementation does not necessarily have to occur during lifespan of ReCAP.	0 km	600 km	1,200 km	Improved maintenance on (average) network of 400 km in 3 countries. Improvements on only 50% after first round of performance monitoring.	No significant improvement in road maintenance but inventories have been prepared for 1188 km of road and condition monitoring is being carried out in preparation for improved maintenance when funding becomes available.
Outcome Indicator 3					
Number of citations in academic articles of ReCAP articles and/or working papers, conference papers etc.	2	4	6	2 papers at Mombasa conference and 4 in subsequent conferences.	<p>Papers submitted to conferences:</p> <p>Mombasa March 2016:</p> <ul style="list-style-type: none"> ▪ Geddes and Gongera; and ▪ Burrow et al. <p>SARF/IFR/PIARC Regional Conference for Africa Oct 2018:</p> <ul style="list-style-type: none"> ▪ Geddes, Pinard, Bopoto; ▪ Burrow; ▪ Kakiiza; and ▪ Kome. <p>PIARC World Road Congress October 2019:</p> <ul style="list-style-type: none"> ▪ Geddes et al. <p>TRB International Conference on Low Volume Roads Sept 2019</p> <ul style="list-style-type: none"> ▪ Bopoto. <p>Total - 8</p>

INDICATOR	Milestone 1 (July 2016)	Milestone 2 (July 2017)	Milestone 3 (July 2018)	Assumptions	Achievement November 2018
Output Indicator 1.1					
LVRR: Number of peer reviewed papers generated from ReCAP supported or related LVRR research projects made available in open access format.	0	1	2	Appropriate journals identified.	6 peer reviewed papers related to LVRR published.
Output Indicator 1.2					
TS: Number of peer reviewed papers generated from ReCAP supported or related transport services research projects made available in open access format.	0	1	2	Papers on economic indicators related to transport services.	2 papers on economic indicators related to transport services (Kakiiza and Kome Durban 2018).
Output Indicator 1.3					
ENGINEERING Research: National policies, manuals and guidelines and document outputs fully incorporated into Government/Ministerial requirements, specifications and recommended good practice that have been modified or introduced as a result of ReCAP engineering research (including climate change adaptation and AFCAP and SEACAP adaptations)	0	1	3	Improved asset management practice adopted in 3 countries by 2018.	Improved asset management practice adopted in Zambia, Uganda, Sierra Leone and Tanzania.
Output Indicator 1.4					
TRANSPORT SERVICES Research: National policies, regulations and/or practices for rural transport services modified or introduced as a result of ReCAP research (including road safety and gender and AFCAP and SEACAP research)	0	0	0	Currently not part of project objectives.	Not part of project objectives.
Output Indicator 1.5					
Cost Benefit Analysis conducted to determine cost effectiveness of the solutions proposed based on ReCAP research, conducted on a whole of life road cost basis.	0	0	4	Cost benefit analysis carried out on maintenance investments in 4 countries.	No cost benefit analysis carried out due to lack of funding for maintenance during project period.
Output Indicator 1.6					
LVRR and TS information generated for dissemination, and disseminated, that is not peer reviewed. Total to include research papers, final research reports, workshop reports, manuals and guidelines	4	10	14	Country performance reports prepared and disseminated locally and in PIT. Research findings include in UoB short course curricula.	<ul style="list-style-type: none"> ▪ Formulation Phase Report; ▪ Baseline Study Report; ▪ Six Quarterly Progress Reports; ▪ Mombasa Workshop Report; ▪ Three PIT meeting reports; and ▪ Practitioners' Guideline. Total- 13

INDICATOR	Milestone 1 (July 2016)	Milestone 2 (July 2017)	Milestone 3 (July 2018)	Assumptions	Achievement November 2018
Output Indicator 2.1					
Research capacity: Proportion of research projects undertaken by country-based African/ Asian experts or institutions taking lead roles.	0.8	0.8	0.8	All researchers based in Africa except UoB staff.	All researchers based in Africa except UoB Supervisor.
Output Indicator 2.2					
Number of research projects managed through National Research Centres and supported by ReCAP funding for technical assistance and capacity building. Operational - initiating, carrying out and producing papers from research projects.	0	0	0	Links established to national research centres but not directly involved.	<ul style="list-style-type: none"> ▪ Uganda component managed by UNRA research unit; and ▪ Zambia component managed by RDA research unit.
Output Indicator 2.3					
Number of research projects with female researcher inputs at senior technical level.	1	1	1	Min 2 females on research team.	Two females on research team.
Output Indicator 3.1					
Research centres in partner countries are linked to an electronic repository for rural transport knowledge.	0	0	0	Not part of project objectives.	All principal project outputs posted on ReCAP website.
Output Indicator 3.2					
ReCAP generated knowledge presented and discussed at high level international development debates and conferences. Cumulative targets where high level = multilateral such as UN, IFIs, AU, ECOWAS, SAARC or other similar inter-ministerial level.	0	0	1	AFCAP PMU will identify appropriate forum.	Paper to be presented at PIARC World Road Congress October 2019.
Output Indicator 3.3					
ReCAP generated knowledge disseminated through dedicated training and workshops, virtually or physical, that are positively rated by participants. Cumulative number of workshops organised by ReCAP.	4	8	12	Workshops in each participating country and regional PIT meetings. Additional dissemination workshops at regional conferences.	<ul style="list-style-type: none"> ▪ Mombasa Workshop 2016; ▪ Workshop at T2 Conference 2017; and ▪ Three PIT meetings. Total- 5

Annex 5 Summary of Progress with PhD Degrees (March 2019)

Robert Kakiiza

In the last three months Robert Kakiiza has completed his systematic review of the literature to assess approaches to monetise social benefit. From this process he uncovered several promising techniques including Hedonist pricing, Stated Preference and Human Capital / loss of productivity. He is now developing a model for monetising rural road benefits from the findings of the systematic review. He has also been working on developing a journal paper to reflect the findings of his systematic review. This is at a draft stage and it is anticipated it will be submitted in June. Eng. Kakiiza has also been preparing his 21-month academic report which will be examined formally during his visit to the University of Birmingham in April – June 2019.

Peter Kome

Peter Kome's work over the past three months has been a mixture of academic study and practical activities associated with implementing the GEM methodology in Sierra Leone. In terms of the former, Eng. Kome has been refining the current version of his financial road of rural road investment and collecting additional data. He has also been reviewing the risk management literature to transform his financial model to one which considers uncertainty in funding, data and maintenance. He has also been preparing his 21-month formal academic report which is to be examined during his forthcoming planned visit to Birmingham (May-July 2019).

In terms of his practical work Eng Kome has been:

- Training the new Sierra Leone Road Authority (SLRA) Tonkolili district engineer and several local authorities on the key GEM project deliverables.
- Working towards transforming the Feeder Roads Department, SLRA (with the approval of the authority's management and board of directors) to act as a surrogate local council administration. This is to help to ensure the uptake of the knowledge gained from the GEM project.
- Assisting with rolling out of aspects of the GEM programme in a new district (the Western Area Rural District).
- Negotiating with the SLRA for funding to continue to undertake:
 - Socio-economic surveys across all ten market centres; and
 - Road asset condition survey on the 250 km GEM rural road network, using 200m road segments.

(The data from these activities will be used within Eng Kome and Robert Kakiiza's PhD research).

Annex 6 Summary of Social and Economic Data (selected indicators)

CHONGWE MUNICIPAL, ZAMBIA SURVEYS: BASELINE - 2016; SECOND SURVEY - 2017; THIRD SURVEY - 2018

Baseline Survey 2016 - Chongwe Zambia											
	Units	Trading Centre									
Name of Trading Centre (TC)		Kanakantapa	Mpango	Kapete	Chilyabale	Nchute	Mulalika	Mwalumina	Lwimba	Chiyota	Soko Bar
Distance from District Centre (DC): CHONGWE	Km	20	22	6.5	30	40	45	29	20	42	28
Average travel time to DC (by different modes of transport)	Min	20	22	13	60	60	80	55	40	45	20
Name of the road serving the trading centre		Matipula	Mpango	T4 - Kapete	Mwalumina	Nchute-Lukoshi	Ndapula - Lwimba	Mwampatisha	Kasubanya	Mapulanga	RD 480 - Kasisi
How many days of the year is the road closed due to rains?	No.	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Availability and cost of transport											
No. of private transport operators serving the trading centre		216	125	216	175	160	168	168	166	159	161
Light vehicle	No.	50	45	50	40	35	50	50	48	45	47
Bus/combi	No.	60	10	60	50	48	48	48	48	47	46
Motorcycle (boda-boda)	No.	70	50	70	50	47	35	35	35	35	38
Freight transport /trucks	No.	36	20	36	35	30	35	35	35	32	30
No. of available trips to DC per day (on a normal day) - Passenger		7	46	7	5	5	5	5	4	5	5
Light vehicle	No.	3	38	3	2	2	3	3	2	2	2
Bus/combi	No.	4	8	4	3	3	2	2	2	3	3
Freight transport /trucks	No.	5	42	5	4	4	3	3	3	3	3
Fares on public transp. to the district centre (pass-km)											
Light vehicle	ZMK	5	5	5	10	15	25	30	50	60	65
Bus/combi	ZMK	7	7	7	12	16	27	32	52	62	67
Cost of freight transp. to the district centre (ton-km)											
Truck (...tons)	ZMK	300	300	300	600	600	1500	1600	1800	1500	2000
Light vehicle (...tons)	ZMK	150	300	150	300	300	1700	1700	1800	1900	2300
Price of goods in the trading centre		Kanakantapa	Mpango	Kapete	Chilyabale	Nchute	Mulalika	Mwalumina	Lwimba	Chiyota	Soko Bar
Maize: 50kg	ZMK	80	80	80	80	80	80	80	80	80	80
Petro: 10 litres	ZMK	125	125	125	125	125	125	125	125	125	125

Maize seeds: 10kg SEEDCO	ZMK	160	160	160	160	160	160	160	160	160	160
Road safety											
No. of accidents on the road serving the TC for past year	No.	10	10	10	9	8	8	6	6	5	5
Agriculture											
Price of main cash crop produce in the TC (per kg)	ZMK	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Economic activities - non-farm											
No. of shops / kiosks in the trading centre	No.	20	5	1	12	13	6	5	4	3	9

Comparative Survey 2017 - Chongwe Zambia

	Units	Trading Centres									
Name of Trading Centre (TC)		Kanakantapa	Mpango	Kapete	Chilyabale	Nchute	Mulalika	Mwalumina	Lwimba	Chiyota	Soko Bar
Distance from District Centre (DC): CHONGWE	Km	20	22	6.5	30	40	45	29	20	42	28
Average travel time to DC (by different modes of transport)	Min	20	35	13	45	60	80	60	60	45	90
Name of the road serving the trading centre		Matipula	Mpango	T4 - Kapete	Mwalumina	Nchute-Lukoshi	Ndapula - Lwimba	Mwampatisha	Kasubanya	Mapulanga	RD 480 - Kasisi
How many days of the year is the road closed due to rains?	No.	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
No. of private transport operators serving the trading centre	No.	216	25	216	175	160	168	168	166	159	161
Light vehicle	No.	50	10	50	40	35	50	50	48	45	47
Bus/combi	No.	60	3	60	50	48	48	48	48	47	46
Motorcycle (boda-boda)	No.	70	2	70	50	47	35	35	35	35	38
Freight transport /trucks	No.	36	10	36	35	30	35	35	35	32	30
No. of available trips to district centre per day (on a normal day)		7	10	7	5	5	5	5	4	5	4
Light vehicle	No.	3	9	3	2	2	3	3	2	2	1
Bus/combi	No.	4	1	4	3	3	2	2	2	3	3
Freight transport /trucks	No.	5	3	5	4	4	3	3	3	3	3
Fares on public transport to the district centre (pass-km)											
Light vehicle	ZMK	5	25	5	10	25	25	30	35	30	25
Bus/combi	ZMK	7	25	7	12	25	27	32	35	30	25
Cost of freight transp. to the district centre (ton-km)											
Truck (...tons)	ZMK	300	300	300	600	600	1500	1600	1800	1500	2000

Light vehicle (...tons)	ZMK	150	300	150	300	300	1700	1700	1800	1900	2300
Price of goods in the trading centre		Kanakantapa	Mpango	Kapete	Chilyabale	Nchute	Mulalika	Mwalumina	Lwimba	Chiyota	Soko Bar
Maize: 50kg	ZMK	60	60	80	80	80	80	48	80	80	75
<i>Petrol: 10 litres</i>	ZMK	125	125	125	125	125	125	125	125	125	160
<i>Maize seed: 10kg SEEDCO</i>	ZMK	180	230	160	160	160	160	160	160	160	300
Road Safety											
No. of accidents on the road serving the TC for past year	No.	5	1	1	3	3	4	3	2	2	2
Agriculture											
Price of main cash crop produce in the TC (per kg)	ZMK	1.20	1.20	1.20	1.20	1.20	0.96	0.96	0.90	1.20	1.50
Economic activities - non-farm											
No. of shops / kiosks in the trading centre	No.	20	15	2	14	13	6	5	4	5	9

Comparative Survey 2018 - Chongwe Zambia

	Units	Trading Centres									
Name of Trading Centre (TC)		Kanakantapa	Mpango	Kapete	Chilyabale	Nchute	Mulalika	Mwalumina	Lwimba	Chiyota	Soko Bar
Distance from District Centre (DC): CHONGWE	Km	20	22	6.5	30	40	45	29	20	42	28
Average travel time to DC (by different modes of transport)	Min	20	35	13	45	60	80	60	60	45	90
Name of the road serving the trading centre		Matipula	Mpango	T4 - Kapete	Mwalumina	Nchute-Lukoshi	Ndapula - Lwimba	Mwampatisha	Kasubanya	Mapulanga	RD 480 - Kasisi
How many days of the year is the road closed due to rains?	No.	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Availability and cost of transport											
No. of private transport operators serving the trading centre	No.	216	25	216	175	161	173	168	166	159	161
Light vehicle	No.	50	10	50	40	36	55	50	48	45	47
Bus/combi	No.	60	3	60	50	48	48	48	48	47	46
Motorcycle (boda-boda)	No.	70	2	70	50	47	35	35	35	35	38
Freight transport /trucks	No.	36	10	36	35	30	35	35	35	32	30
No. of available trips to district centre per day (on a normal day)		2									
Light vehicle	No.	3	9	3	2	2	4	3	2	2	1
Bus/combi	No.	4	1	4	3	3	2	2	2	3	3
Freight transport /trucks	No.	5	3	5	4	4	3	3	3	3	3

Fares on public transport to the district centre (passenger-km)											
Light vehicle	ZMK	9	30	5	10	28	30	30	35	30	25
Bus/combi	ZMK	9	30	7	12	30	50	32	35	30	25
Cost of freight transport to the district centre (ton-km)											
Truck (...tons)	ZMK	320	350	300	600	675	2800	1600	1800	1500	2000
Light vehicle (...tons)	ZMK	180	320	150	300	450	2500	1700	1800	1900	2300
Price of goods in the trading centre		Kanakantapa	Mpango	Kapete	Chilyabale	Nchute	Mulalika	Mwalumina	Lwimba	Chiyota	Soko Bar
<i>Maize: 50kg</i>	ZMK	120	90	80	80	72	80	84	85	80	105
<i>Petrol: 10 litres</i>	ZMK	160	180	125	125	160	200	180	160	125	160
<i>Maize seed: 10kg SEEDCO</i>	ZMK	210	290	160	160	250	160	160	230	160	300
Road Safety											
No. of accidents on the road serving the TC for past year	No.	0	1	0	0	0	0	0	0	1	0
Agriculture											
Price of main cash crop produce in the TC -Maize (per kg)	ZMK	1.20	1.20	1.20	1.20	1.20	0.96	0.96	0.90	1.20	1.50
Economic activities - non-farm											
No. of shops / kiosks in the trading centre	No.	20	15	2	14	13	6	5	4	5	9

TONKOLILI DISTRICT, SIERRA LEONE SURVEYS: BASELINE - 2016; SECOND SURVEY - 2017; THIRD SURVEY - 2018

Baseline Survey 2016 - Tonkolili Sierra Leone

Name of Trading Centre (TC)	Units	Trading Centres									
		Makong	Manasi	Mamaso sanka	Masanga	Mangebana Centre	Petifu Fula Masa	Mafurabi	Mayira	Magbass	Masombrie
Distance from District Centre (DC): <i>Magburaka Town</i>	Km	44	48	42.5	15	12.4	70	48	36.9	9.4	43.6
Average travel time to district centre (motorbike, car, truck)	Min.	80	105	110	22	45	121	150	165	45	80
Name of the road serving the trading centre		Makali - Makong	Makoni - Manasi	Markoni - Mamaso sanko	Matham - Masanga road	Matotoka Mangebana Road	Yoni Bana -Petifu road	Old ferry - Mafurabi road	Mile 91 - Mayira road	Magburaka - Magbass	Masombrie- Magburaka road
How many days of the year is the road closed due to rains?	No.	45	0	2	7	2	0	2	10	4	3
Availability and cost of transport											
No. of private transport operators serving TC	No.	70	25	59	50	95	15	38	62	25	104
Light vehicle	No.	0	0	4	0	11	0	5	32	0	1
Motorcycle / Okada	No.	70	25	55	50	80	15	30	0	22	100
Freight transport /trucks	No.	0	0	0	0	4	0	3	30	3	3
No. of available trips to district centre per day (on a normal day) - Passenger	No.	20	10	40	50	23	8	21	8	8	64
Light vehicle	No.	0	0	2	0	5	0	1	4	0	1
Bus/combi (poda-poda)	No.	10	0	0	0	0	0	20	0	0	0
Freight transport /trucks	No.	0	0	0	0	2	0	1	0	0	1
Motorcycle /okada	No.	10	10	38	50	18	8		4	8	63
Fares on public transport to the DC	Le/person										
Light vehicle	Le/person	40,000	25,000	25,000	7,000	10,000	0	35,000	15,000	3,000	15,000
Motorcycle / Okada	Le/person	25,000	20,000	30,000	5,000	20,000	30,000	30,000	30,000	3,000	20,000
Cost of freight transport to the DC	Le/50kg										
Truck - Rice	Le/50kg					30,000		70,000		60,000	80,000
Light vehicle - Rice	Le/50kg		10,000	5,000	2,000	60,000		100,000	100,000		100,000
Motorcycle/Okada - Rice	Le/50kg	12,000	25,000	10,000	3,000		80,000	150,000	150,000	40,000	150,000
Price of goods in the trading centre											
<i>Rice</i>	Le/butter cup	1,200	1,300	1,300	1,200	1,400	1,300	1,000	1,200	1,000	1,300

<i>Petrol (per litre) official price was Le 3,750</i>	Le/Litre	8,500	7,000	7,000	5,000,	5,000	6,000	7,000	7,000	6,500	7,000
<i>Battery big size (BB) and medium size (BM)</i>	Le/BB	7,000	6,000	5,000	6,000		3,000	3,000		2,500	3,000
	Le/BM	4,000	3,000	3,000	2,500	1,500		2,500		2,000	2,000
Road safety											
No. of accidents on road serving the TC - past year	No.	0	35	32	25	0	0	8	5	0	20
Economic activities - non-farm											
No. of shops / kiosks in the TC	No.		0	7	7	2	0	0	0	6	7 (+15S)

Comparative Survey 2017

		Trading Centres									
Name of Trading Centre (TC)	Units	Makong	Manasi	Mamaso sanka	Masanga	Mangebana Centre	Petifu Fula Masa	Mafurabi	Mayira	Magbass	Masombrie
Distance from District Centre (DC): Magburaka Town	km	44	42	42.5	15	17	70	48	36.9	9.4	43.6
Average travel time to district centre (vehicle)	Min.	57	38	38	25	26	130			18	59
Name of the road serving the trading centre		Makali - Makong	Makoni - Manasi	Markoni - Mamaso sanka	Matham - Masanga	Matotoka Mangebana	Yoni Bana -Petifu	Old ferry - Mafurabi	Mile 91 - Mayira	Magburaka - Magbass	Masombrie- Magburaka
How many days of the year is the road closed due to rains?	No.	7	0	0	0	0	0	3	1	0	3
Availability and cost of transport											
No. of private transport operators serving the TC	No.	30	13	19	37	24	32	11	15	34	54
Light vehicle	No.	0	0	1	0	6	5	1	2	4	4
Bus/combi (poda-poda)	No.	0	0	0	0	0	4	10	2	0	0
Motorcycle / Okada	No.	30	12	15	35	18	20	0	10	30	50
Freight transport /trucks	No.	0	1	3	2	0	3		1	0	0
No. of available trips to district centre per day (on a normal day) - Passenger	No.	30	12	16	35	19	20	10	10	30	50
Light vehicle	No.	0	0	1	0	1	0	0	0	0	0
Bus/combi (poda-poda)	No.	0	0	0	0	0	0	0	0	0	0
Freight transport /trucks	No.	0	0	1	0	0	0	0	0	0	0
Motorcycle (boda-boda) /okada	No.	30	12	15	35	18	20	10	10	30	50
Fares on public transport to the DC											

Light vehicle	Le / person	25,000	25,000	25,000	6,000	10,000	25,000	0	40,000	0	15,000
Bus/combi (poda-poda)	Le / person	0	20,000	0	5000	0	20,000	25,000	35,000	0	0
Motorcycle (boda-boda) / Okada	Le / person	30,000	30,000	25,000	10,000	20,000	40,000	50,000	50,000	6,000	25,000
Cost of freight transport to the DC	Le/kg										
Truck - Rice	Le/50kg	0	0	0	0	0	0	0	0	0	0
Light vehicle - Rice	Le/50kg	10,000	10,000	0	4,000	4,000	0	0	0	0	10,000
Motorcycle - Rice	Le/50kg	15,000	15,000	0	5,000	5000	0	0	0	4,000	15,000
Price of goods in the trading centre											
Rice	Le/butter cup	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Petrol (per litre) official price is Le 6,000	Le/Litre	7,500	7,000	7,200	6500	6,500	7,500	7,000	6,500	6,500	7,000
Battery - big size (BB), medium size (BM)	Le/2BB	3,000	3,000	2,000	3,000	2,500	3,000	3,000	2,000	2,500	3,000
	Le/4BM	3,000	4,000	2,000	2,500	200	3,000	2,000	2,500	2,000	3,000
Road safety											
No. of accidents on the road serving the trading centre for past year	No.	15	4	38	8	6	0	0	20	3	75
Economic activities - non-farm											
No. of shops (S) / kiosks (K) in the trading centre	No.	6S, 25K	0S, 1K	4S, 7K	0S, 7K	0S, 0K	0S, 1K	0S, 0K	0S, 2K	0S, 2K	0S, 0K

Comparative Survey 2018

Name of Trading Centre (TC)	Units	Trading Centres									
		Makong	Manasi	Mamaso sanko	Masanga	Mangebana Centre	Petifu Fula Masa	Mafurabi	Mayira	Magbass	Masombrie
Distance from District Centre (DC): Magburaka Town	Km	44	42	42.5	15	17	70	48	36.9	9.4	43.6
Average travel time to district centre (vehicle)	Min.	87	98	90	20	45	120	150	165	43	65
Name of the road serving the trading centre		Makali - Makong	Makoni - Manasi	Markoni - Mamaso sanko	Matham - Masanga	Matotoka - Mangebana	Yoni Bana -Petifu	Old ferry - Mafurabi	Mile 91 - Mayira	Magburaka - Magbass	Masombrie- Magburaka
How many days of the year is the road closed due to rains?	No.	50	3	2	0	2	0	3	12	0	1
Availability and cost of transport											
No. of private transport operators serving the trading centre	No.	26	25	41	75	70	23	43	56	30	110
Light vehicle	No.	0	0	1	6	2	1	3	10	2	1
Bus/combi (poda-poda)	No.	0	0	0	0	0	0		1	0	2
Motorcycle /boda-boda (Okada)	No.	26	25	40	64	67	22	39	0	27	100

Freight transport /trucks	No.	0	0	0	0	1	0	1	45	1	7
No. of available trips to district centre per day (on a normal day)	No.	9	6	12	46	70	23	43	12	30	70
Light vehicle	No.	0	0	0	0	0	0	1	0	0	1
Bus/combi (poda-poda)	No.	0	0	0	0	0	0	21	0	0	0
Freight transport /trucks	No.	0	0	0	0	0	0	0	0	0	0
Motorcycle (boda-boda) /okada	No.	9	6	12	46	19	8		4	8	69
Fares on public transport to the DC	Le/person										
Light vehicle	Le/person		27,000	30,000	10,000	10,000	25,000	35,000	20,000	5,000	17,000
Bus/combi (poda-poda)	Le/person			25,000	10,000	10,000		35,000		5,000	
Motorcycle (boda-boda) / Okada	Le/person	30,000	25,000	35,000	12,000	20,000	30,000	30,000	30,000	5,000	20,000
Cost of freight transport to the district centre - Rice	Le/50kg										
Truck	Le/50kg					4,000		10,000		3,000	3,000
Light vehicle	Le/50kg		12,000	10,000	5,000	5,000	10,000	10,000	10,000		10,000
IMTs /motorcycle	Le/50kg	15,000	25,000	12,000	5,000	5,000	15,000	20,000	15,000	5,000	15,000
Price of goods in the trading centre											
Rice	Le/butter cup	1,500	1,500	1,500	1,500	1,500	1,700	1,200	1,500	1,300	1,500
Petrol (per litre) official price is Le 8,000	Le/Litre	10,000	10,000	10,000	9,000	8,500	10,000	10,000	9,500	8,000	9,000
Battery - big size (BB), medium size (BM)	Le/2BB	4,000	3,700	3,200	3000	3200	3500	3200	3,500	3,000	3500
	Le/4BM	3,500	3,000	3,000	3200	3500	3,400	3,500	3,200	3,000	4000
Road safety											
No. of accidents on the road serving the trading centre for past year	No.	8	5	10	1	4	2	10	7	2	14
Economic activities - non-farm											
No. of shops (S) / kiosks (K) in the trading centre	No.	10	5	6	14	5	0	0	0	6	29

KAMULI DISTRICT, UGANDA SURVEYS: BASELINE - 2016; SECOND SURVEY - 2017; THIRD SURVEY - 2018

Baseline Survey 2016 - Kamuli Uganda											
	Units	Trading Centre									
Name of Trading Centre (TC)		Kiwungu	Namaira	Nabulezi	Kagumba	Wandegeya	Nawandyo	Namaganda	Kiyunga	Ndalike	Kyeya
Distance from District Centre (DC): <i>Kamuli</i>	Km	9	14	19	27	17	20	19	24	24	22
Average travel time to district centre – <i>Boda-boda</i>	Min	30	30	60	60	40	45	45	45	50	50
Name of the road serving the trading centre		Bul-Kak	Bal-Nam	Bal-kym	Naw-Kib	Kas-Bug	Kas-Wan	Nam-Bul	Nam-Bug	Nam-Nda	Nam-Ky
How many days of the year is the road closed due to rains?	No.	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
Availability and cost of transport											
No. of private transport operators serving the trading centre											
Light vehicle	No.	0	0	1	1	0	0	0	0	2	0
Bus/combi	No.	0	0	0	0	0	0	0	1	1	0
Motorcycle (boda-boda)	No.	70	50	30	40	40	60	70	80	150	41
Freight transport /trucks (10 tonnage)	No.	5	10	3	6	11	5	4	3	6	2
No. of available trips to district centre per day (on a normal day)											
Light vehicle	No.	0	0	2	2	0	0	0	0	4	0
Motorcycle (boda-boda)	No.	210	150	60	80	120	180	280	320	450	164
Bus/Taxi		0	0	0	0	0	0	0	0	2	0
Freight transport /trucks (10 Tonnage)	No.	5	10	3	6	11	5	4	3	6	
Fares on public transport to the district centre											
Light vehicle	UGX	0	0	150	185	0	0	0	208	83	
Bus/combi	UGX	0	0	0	0	0	0	0	0	62	
Motorcycle (boda-boda)	UGX	166	179	150	259	588	500	131	208	83	136
Cost of freight transport to the district centre											
Truck (10 tons)	UGX	1111	1785	1250	741	1176	2000	789	2083	416	681
Light vehicle	UGX		1785	1250	556				2916	416	
IMTs /motorcycle	UGX	1667	3571	2500	2222	2941	2500	1315	2500	1041	1365
Prices of goods in the trading centre											
<i>Coffee (wet red bean coffee per Kg)</i>	UGX	1,000	1,000	1,000	1,200	1,200	1,200	1,000	1,000	1,000	1,000
<i>Maize (maize grains per Kg)</i>	UGX	1,100	1,000	1,000	1,100	1,200	1,200	1,100	1,000	1,000	1,000
<i>Rice (processed rice per Kg)</i>	UGX	2,500	2,400	2,400	2,400	2,400	2,600	2,400	2,500	2,200	2,300

Soap (1kg White Star Soap)	UGX	3,800	3,800	4,000	4,000	4,000	3,800	3,800	3,800	3,700	3,800
Sugar (1kg unpacked)	UGX	4,600	4,500	4,400	4,600	4,000	4,000	4,400	4,000	4,400	4,400
Road Safety											
No. of accidents on the road serving the TC for past year	No.	0	0	4	0	5	3	0	6	0	0
Agriculture											
Price of main cash crop produce in the trading centre (per kg)	UGX	1,200	1,100	1,200	1,200	1,200	1,200	1,000	1,100	1,100	1,100
Economic activities - non-farm											
Factories, local industries in the trading centre	No.	4	1	2	3	2	1	4	4	3	2
No. of shops / kiosks in the trading centre	No.	33	40	12	5	20	20	36	75	39	10

Comparative Survey 2017 - Kamuli											
Name of Trading Centre (TC)	Units	Trading Centre									
		Kiwungu	Namaira	Nabulezi	Kagumba	Wandegeya	Nawandyo	Namaganda	Kiyunga	Ndalike	Kyeya
Distance from District Centre (DC): <i>Kamuli</i>	Km	9	14	19	27	17	20	19	24	24	22
Average travel time to district centre – <i>Boda-boda</i>	Min	30	30	60	60	40	45	45	45	50	50
Name of the road serving the trading centre		Bul-Kak	Bal-Nam	Bal-kym	Naw-Kib	Kas-Bug	Kas-Wan	Nam-Bul	Nam-Bug	Nam-Nd	Nam-Ky
How many days of the year is the road closed due to rains?	No.	0	0		0	0	0	0	0	0	0
Availability and cost of transport											
No. of private transport operators serving the trading centre											
Light vehicle	No.	0	0	0	0	0	0	0	0	0	
Bus/combi	No.	0	0	0	0	0	0	0	0	0	0
Motorcycle (boda-boda)	No.	80	55	40	70	60	55	60	80	150	36
Freight transport /trucks (10 tonnage)	No.	11	9	3	7	10	5	11	3	6	5
No. of available trips to district centre per day (on a normal day)											
Light vehicle	No.	0	0	0	0	0	0	0	0	0	
Motorcycle (boda-boda)	No.	320	165	80	140	120	110	180	160	300	72
Bus/Taxi	No.	0	0	0	0	0	0	0	0	0	0
Freight transport /trucks (10 Tonnage)	No.	22	9	3	7	10	5	11	3	6	5
Fares on public transport to the district centre											
Light vehicle	UGX	0	0	0	0	0	0	0	0	0	0

Bus/taxi	UGX	0	0	0	0	0	0	0	0	0	0
Motorcycle (boda-boda) per passenger/km	UGX	166.67	142.86	157.89	222.22	235.29	200.00	157.89	208.33	125.00	136.36
Cost of freight transp. to the district centre (ton-km)											
Truck (10 tons)	UGX	1111.11	857.14	789.47	555.56	882.35	850.00	789.47	833.33	625.00	681.82
Light vehicle	UGX	0	0	0	0	0	0	0	0	0	0
IMTs /motorcycle	UGX	2222.22	2857.14	2631.58	2222.22	2941.18	2500.00	1578.95	2291.67	2083.33	2272.73
Prices of goods in the trading centre											
Coffee (wet red bean coffee per Kg)	UGX	1,100	1,000	1,000	1,100	1,000	1,100	1,000	1,100	1,000	1,000
Maize (maize grains per Kg)	UGX	700	700	600	600	700	750	600	700	700	600
Rice (processed rice per Kg)	UGX	2,500	2,500	2,500	2,500	2,500	2,400	2,350	2,600	2,000	2,000
Soap (1kg White Star Soap)	UGX	3,800	3,800	3,800	3,800	3,800	3,800	4,000	4,000	3,800	3,800
Sugar (1kg unpacked)	UGX	4,400	4,400	4,400	4,400	4,400	4,400	4,400	4,400	4,400	4,800
Road Safety											
No. of accidents on the road serving the TC for past yr	No.					5		40		0	20
Agriculture											
Price of main cash crop produce in the trading centre (per kg)	UGX	1,200	1,100	1,100	1,100	1,100	1,100	1,100	1,200	1,100	1,100
Economic activities - non-farm											
Factories, local industries in the trading centre	No.	4	4	3	2	4	1	1	4	3	2
No. of shops / kiosks in the trading centre	No.	36	40	40	22	40	22	40	77	48	30

Comparative Survey 2018 - Kamuli											
Name of Trading Centre (TC)	Units	Trading Centre									
		Kiwungu	Namaira	Nabulezi	Kagumba	Wandegeya	Nawandyo	Namaganda	Kiyunga	Ndalike	Kyeya
Distance from District Centre (DC): <i>Kamuli</i>	Km	9	14	19	27	17	20	19	24	24	22
Average travel time to district centre – <i>boda-boda</i>	Min	20	30	50	50	35	45	45	45	50	50
Name of the road serving the trading centre		Bul-Kak	Bal-Nam	Bal-kym	Naw-Kib	Kas-Bug	Kas-Wan	Nam-Bul	Nam-Bug	Nam-Nd	Nam-Ky
How many days of the year is the road closed due to rains?	No.										
Availability and cost of transport											
No. of private transport operators serving the trading centre											
Light vehicle	No.	0	0	0	0	0	0	0	0	0	0
Bus/combi	No.	0	0	0	2	0	2	0	4	0	5
Motorcycle (boda-boda)	No.	80	50	43	54	62	50	54	95	135	52

Freight transport /trucks (10 tonnage)	No.	15	12	8	22	21	18	14	24	24	21
No. of available trips to district centre per day (on a normal day)											
Light vehicle	No.										
Motorcycle (boda-boda)	No.	240	150	86	108	124	100	108	285	270	104
Bus/Taxi	No.	2					2		4		
Freight transport /trucks (10 Tonnage)	No.	30	24	8	22	21	18	14	29	24	21
Fares on public transport to the district centre											
Light vehicle	UGX	0.00									
Bus/taxi	UGX	0.00			185.19		200.00		166.67		
Motorcycle (boda-boda) per passenger/km	UGX	111.11	142.86	157.89	222.22	235.29	200.00	157.89	166.67	145.83	159.09
Cost of freight transp. to the district centre (ton-km)											
Truck (10 tons)	UGX	1222.22	857.14	842.11	592.59	833.33	850.00	842.11	791.67	750.00	818.18
Light vehicle	UGX	0.00									
Motorcycle (one bag per freight)	UGX	2222.22	2857.14	3684.21	2592.59	2941.18	2500.00	2105.26	2500.00	2083.33	2272.73
Prices of goods in the trading centre											
<i>Coffee (wet red bean coffee per Kg)</i>	UGX	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
<i>Maize (maize grains per Kg)</i>	UGX	300	300	300	300	300	300	300	300	300	300
<i>Rice (processed rice per Kg)</i>	UGX	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	2,000
<i>Soap (1kg White Star Soap)</i>	UGX	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
<i>Sugar (1kg unpacked)</i>	UGX	4,400	4,400	4,400	4,300	4,300	4,300	4,300	4,300	4,400	
Road Safety											
No. of accidents on the road serving the TC for past year	No.	7	6	10	5	5	2	4	10	60	20
Agriculture											
Price of main cash crop produce in the trading centre (per kg)	UGX	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100
Economic activities - non-farm											
Factories, local industries in the trading centre	No.	4	4	3	2	4	1	1	4	3	2
No. of shops / kiosks in the trading centre	No.	39	60	30	18	54	45	73	64	86	43

KAMULI DISTRICT, UGANDA / UNRA SURVEYS: BASELINE - 2016; SECOND SURVEY - 2017; THIRD SURVEY - 2018

Baseline Survey 2016 - Kamuli/UNRA Uganda											
	Units	Trading Centre									
Name of Trading Centre (TC)		Buyende	Bulopa	Irundu	Iyingo	Kidera	Nawantale	Namasagali	Namwendwa	Nawaiko	Nakabugu
Name of District Centre (DC) considered		Kamuli	Kamuli	Buyende	Buyende	Buyende	Kamuli	Kamuli	Kamuli	Kaliro	Luuka
Distance from the nearest district centre	Km	38	24	37	39	35	15	24	15	28	4
Average travel time to nearest district centre											
1. light vehicle	Min	N/A	N/A	150	N/A	N/A	180	N/A	30	30	30
2. Bicycles	Min	60	180	180	180	240	120	120		120	60
3. Boda-boda	Min	50	60	150	60	120	60	30	60	20	30
4. Taxi	Min	50	60	150		60	90	30	120	50	30
5. Other (specify) - Truck						120	300		420		180
Name of the road serving the trading centre from the district centre		Kamuli-Nabirumba-Buyende	Iganga-Nakabugu-Bulopa-Kamuli	Irundu - Kaliro - Iganga	Iyingo - Kamuli - Nabirumba -Buyende	Buyende-Kidera	Kamuli-Nawantale-Kidera-Bukungu	Kamuli-Namasagali road, via Budumbula	Namwendwa-Kamuli	Kaliro-Nawaiko-Irundu	Kamuli-Iganga road, via Kiyunga
How many days of the year is the road closed due to rains?	No.	3	0	0	0	0	2	2	0	1	3
Availability and cost of transport											
No. of private transport operators serving the TC											
Light vehicle	No.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	50	N/A	8
Bus/combi	No.	4	3	20	N/A	15	N/A	1	14	6	3
Motorcycle (boda-boda)	No.	60	30	200	20	80	30	80	250	80	300
Freight transport /trucks	No.	20	3	10	N/A	7	11	20	140	5	4
No. of available trips to the DC per day (on a normal day)											
Light vehicle	No.	N/A	N/A	N/A	N/A	N/A		N/A	250	N/A	24
Bus/combi	No.	4	6	40	1	45		3	56	6	3
Motorcycle (boda-boda)	No.	240	90	800	60	240	60	480	750	240	2700
Freight transport /trucks	No.	40	3	N/A		7	11	40	140	5	28
Fares on public transport to the district centre											
Light vehicle	UGS	N/A	N/A	N/A	N/A	N/A		N/A	133	89	750
Bus/combi	UGS	106	125	135	128	143		167	200	107	1000
Motorcycle (boda-boda)	UGS	211	208	216	385	286	380	203	200	179	500
Cost of freight transport to the district centre (ton-km)											
Truck (...tons)	UGS	1053	1667	N/A	N/A	1143	3616	1389	3333	1786	5000
Light vehicle (...tons)	UGS	N/A	N/A	N/A	N/A	N/A		N/A	2667	N/A	5000
IMTs /motorcycle (...tons)	UGS	2105	2083	5405	5128	3429	3797	N/A	2667	2143	5000
Prices of items exported from the TC											
Item 1: Maize	Per kg	1200	500	500	800	800	800	500	700	500	1000
Item 2: Rice; Sugarcane; Cassava; Beans	Per kg	2000	100	400	700	800	800	2350	1600	1500	100

Prices of items imported into the TC											
<i>Item 1: Sugar</i>	Per kg	2400	4000	4800	4000	4000	4000	4000	4000	4000	4000
<i>Item 2: salt</i>	Per kg	800	1400	1000	1000	1000	1200	1200	1500	1000	1000
Road Safety											
No. of accidents on the road serving the TC for past year	No.		20	28	10	40	30	20		20	20
Agriculture											
Price of main cash crop produce in the TC (Maize)	Per kg	1200	500	800	N/A	700	800	500	700	500	1000
Farm-gate price of main cash crop produce in the village (Maize)	Per kg	500	300	800	800	600	750	200	700	500	700
Economic activities - non-farm											
Factories, local industries in the trading centre	No.	6	9	28	0	20	6	11	25	0	7
No. of shops / kiosks in the trading centre	No.	45	220	100	12	120	80	70	370	50	36

Comparative Survey 2017 - Kamuli/UNRA Uganda											
	Units	Trading Centre									
Name of Trading Centre (TC)		Buyende	Bulopa	Irundu	Iyingo	Kidera	Nawantale	Namasagali	Namwendwa	Nawaikoke	Nakabugu
Name of District Centre (DC) considered		Kamuli	Kamuli	Buyende	Buyende	Buyende	Kamuli	Kamuli	Kamuli	Kaliro	Luuka
Distance from the nearest district centre	Km	38	24	37	39	35	15	24	15	28	4
Average travel time to nearest DC (different modes of transport)											
1. light vehicle	Min	N/A	N/A	N/A			30	120	30		5
2. Bicycles	Min	240	180	240	240	180	60	240	90	120	20
3. Boda-boda	Min	60	60	60	120	150	25	60	50	45	7
4. Taxi	Min	N/A	N/A	30	60	40	40	120	40	15	10
5. Other (specify) - Truck		N/A				40	120	420	240	30	60
Name of the road serving the trading centre from the district centre		Kamuli-Nabirumba-Buyende	Iganga-Nakabugu-Bulopa-Kamuli	Irundu - Kaliro - Iganga	Iyingo - Kamuli - Nabirumba -Buyende Road	Buyende-Kidera	Kamuli-Nawantale-Kidera-Bukungu	Kamuli-Namasagali road, via Budumbula	Namwendwa-Kamuli	Kaliro-Nawaikoke-Irundu	Kamuli-Iganga road, via Kiyunga
How many days of the year is the road closed due to rains?	No.	16	4	7	2	2	4	14	10	3	5
Availability and cost of transport											
No. of private transport operators serving the TC											
Light vehicle	No.	N/A	N/A	N/A	4	2	3	1	35	N/A	10
Bus/combi	No.	N/A	20	5	1	3	3	1	20	2	2
Motorcycle (boda-boda)	No.	80	170	50	20	30	35	50	250	45	200
Freight transport /trucks	No.	3	320	N/A	1	7	11	32	40	1	4
No. of available trips to DC per day (on a normal day)											
Light vehicle	No.	N/A	N/A	N/A	4	2	3	1	70	N/A	50
Bus/combi	No.	N/A	20	5	1	3	3	1	60	2	2
Motorcycle (boda-boda)	No.	160	680	150	20	30	140	350	1250	100	1400
Freight transport /trucks	No.	6	640	N/A	N/A	7	22	96	160	1	20

Fares on public transport to the DC (pass-km)											
Light vehicle	UGS	N/A	N/A	N/A		286	200	167	200	N/A	750
Bus/combi	UGS	106	167	96	129	143	200	167	134	72	250
Motorcycle (boda-boda)	UGS	211	250	406	129	429	200	209	267	107	250
Cost of freight transport to the district centre (ton-km)											
Truck (.tons)	UGS	1053	1500	N/A	N/A	1191	1111	1250	2667	770	4167
Light vehicle (...tons)	UGS	N/A		N/A	N/A	N/A	2000	3333	3333	N/A	5000
IMTs /motorcycle (...tons)	UGS	2105		N/A	N/A	5357	3333	2083	6667	1923	5000
Prices of items exported from the TC											
Maize	Per kg	850	800	500	800	800	700	700	800	500	600
Rice; Sugarcane; Cassava; Beans	Per kg	2000	100	350	700	1000	900	2800	3200	1500	500
Prices of three items imported into the TC											
Item 1: Sugar	Per kg	5000	4800	4800	4500	4400	4000	4800	4000	4400	4000
Item 2: salt	Per kg	1200	1200	1000	1000	1000	800	1200	1000	1000	1000
Road Safety											
No. of accidents on the road serving the trading centre for past yr	No.	7	5	7	N/A	22	N/A	2	6	15	90
Agriculture											
Price of main cash crop produce in the TC (Maize)	Per kg	700	1200	500	800	800	800	700	700	500	600
Farm-gate price of main cash crop produce in the village (Maize)	Per kg	600	700	500	600	800	700	500	500	500	500
Economic activities - non-farm											
Factories, local industries in the trading centre	No.	6	10	10	0	12	4	4	24	9	4
No. of shops / kiosks in the trading centre	No.	185	490	50	40	300	38	77	310	50	40

Comparative Survey 2018 - Kamuli/UNRA Uganda											
	Units	Trading Centres									
Name of Trading Centre (TC)		Buyende	Bulopa	Irundu	Iyingo	Kidera	Nawantale	Namasagali	Namwendwa	Nawaikoke	Nakabugu
Distance from the nearest District Centre (DC)	Km	38	24	37	39	35	15	24	15	28	4
Average travel time to nearest DC (by different modes of transport)											
1. light vehicle	Min	N/A	60	N/A			20	60	30	0	15
2. Bicycles	Min	90	120	240	180	180	60	240	60	180	30
3. Boda-boda	Min	30	40	180	60	180	30	60	30	60	10
4. Taxi	Min	N/A	N/A	60	N/A	30	35	60	30	30	20
5. Other (specify) - Truck		N/A				30	120	300	230		60
Name of the road serving the trading centre from the district centre		Kamuli-Nabirumba road & Nabirumba-Buyende	Iganga-Nakabugu-Bulopa-Kamuli	Irundu - Kaliro - Iganga	Iyingo - Kamuli road & Nabirumba-Buyende	Buyende-Kidera	Kamuli-Nawantale-Kidera-Bukungu	Kamuli-Namasagali road, via Budumbula	Namwendwa-Kamuli	Kaliro-Nawaikoke-Irundu	Kamuli-Iganga road, via Kiyunga
How many days of the year is the road closed due to rains?	No.	15	0	3	0	0	6	14	5	10	0

No. of private transport operators serving the trading centre											
Light vehicle	No.	N/A	6	N/A	N/A	N/A	5	0	40	N/A	3
Bus/combi	No.	N/A	N/A	N/A	N/A	N/A	10	1	25	N/A	5
Motorcycle (boda-boda)	No.	30	160	100	4	60	48	60	260	40	250
Bicycles	No.		13	N/A	N/A	5	N/A	N/A	11	N/A	N/A
Freight transport /trucks	No.	6	30	N/A	N/A	1	15	20	30	N/A	10
No. of available trips to DC per day (on a normal day)											
Light vehicle	No.	N/A	12	N/A	N/A	N/A	10	0	400	N/A	12
Bus/combi	No.	N/A	20	N/A	N/A	1	20	1	300	N/A	20
Motorcycle (boda-boda)	No.	60	800	100	4	180	384	180	2080	40	2500
Freight transport /trucks	No.	6	30	N/A	N/A	7	75	20	60	N/A	40
Fares on public transport to the DC (pass-km)											
Light vehicle	UGS	N/A	166.68	N/A		N/A	233.33	0	133.33	N/A	250
Bus/combi	UGS	131.58	125	135.14		143	200	125	133.33	178.57	175
Motorcycle (boda-boda)	UGS	263.16	250	135.14	85.47	285.71	133.33	250	267	285.71	250
Bicycles	UGS	N/A		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cost of freight transport to the district centre (ton-km)											
Truck (.tons)	UGS	1053	961.54	N/A	N/A		2000	1458	1555.56	N/A	5000
Light vehicle (...tons)	UGS	N/A	N/A	N/A	N/A	N/A	1333.33		2000	N/A	3750
IMTs /motorcycle (...tons)	UGS	2631.58	2500	N/A	N/A	4285.71	3333	2500	4000	1785.71	5000
Bicycles (bicycle Operators)	UGS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		N/A
Prices of three items exported from the TC											
<i>Maize</i>	Per kg	300	300	300	300	300	300	250	300	300	300
<i>Rice (R); Sugarcane (Sc); Cassava (CA); Beans (B)</i>	Per kg	2200	136	500	600	4000	400	2500	2400	1000	2000
Prices of three items imported into the TC											
<i>Sugar</i>	Per kg	4500	3800	4800	4600	4000	4000	4000	4200	4500	4000
<i>Salt</i>	Per kg	1200	1200	1000	4000	1000	1200	1200	1200	600	600
Road Safety											
No. of accidents on the road serving the trading centre for past yr	No.	10	13	15	N/A	25	15		10	10	90
Agriculture											
Price of main cash crop produce in the TC (Maize)	Per kg	300	300	300	300	300	350	300	300	300	300
Farm-gate price of main cash crop produce in the village (Maize)	Per kg	250	250	200	300	250	300	250	200	250	250
Economic activities - non-farm											
Factories, local industries in the TC	No.	8	9	12	0	15	4	5	27	10	4
No. of shops / kiosks in the TC	No.	140	550	62	10	287	38	62	330	64	40