



AfCAP

Africa Community Access Partnership



Technical Assistance to Tanzania Local Government Infrastructure and Transportation Research Centre (Interim Phase)

Progress Report 1: October to December 2015



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Abstract

AFCAP2 is providing technical assistance to the Directorate of Infrastructure Development in the Prime Minister's Office: Regional Administration and Local Government of Tanzania, to achieve its objective of setting up a Local Government Infrastructure and Transportation Research Centre (LoGITReC) in Dodoma .

During 2014/15, a strategic plan for implementation of LoGITReC's research priorities in accordance with the National Transport Policy was developed. This plan addressed: (a) the vision, mission, goal and strategic objectives of LoGITReC; (b) governance issues, including the role and responsibilities of the Steering Committee, the institutional and physical location of LoGITReC, sources of funding, key performance indicators, and strategic relationships and linkages; (c) the short to longer term research agenda of LoGITReC, which future revisions will be guided by a Technical Committee, which also still has to be convened, and the establishment of specific internal and external technical committees and working groups; (d) capacitation of LoGITReC in terms of human resources and research infrastructure; and (d) establishing mechanisms for creating greater visibility of LoGITReC and for sharing/disseminating/demonstrating its achievements. In addition to the above, a budget was proposed, but this will have to be reassessed following the physical establishment of LoGITReC.

The objectives of this 12-month Technical Assistance programme to LoGITReC are as follows:

- 1) to make further progress with priority activities for the establishment and operationalisation of LoGITReC; and
- 2) to achieve the key performance indicator targets set out in the LoGITReC Strategic Plan for the first year of operation.

This report outlines the progress that has been achieved between October and December 2015.

Key words

Road Research Centre, capacity building, Research & Development, laboratory management

AFRICA COMMUNITY ACCESS PARTNERSHIP (AfCAP)
Safe and sustainable transport for rural communities

AfCAP is a research programme, funded by UK Aid, with the aim of promoting safe and sustainable transport for rural communities in Africa. The AfCAP partnership supports 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. AfCAP is brought together with the Asia Community Access Partnership (AsCAP) under the Research for Community Access Partnership (ReCAP), managed by Cardno Emerging Markets (UK) Ltd.

See www.afcap.org

Acronyms

AFCAP	:	Africa Community Access Programme
ARTReF	:	African Road and Transport Research Forum
CSIR	:	Council for Scientific and Industrial Research
CML	:	Central Materials Laboratory
DFID	:	Department for International Development (UK)
DID	:	Directorate of Infrastructure Development
IT	:	Information Technology
LoGITReC	:	Local Government Infrastructure and Transportation Research Centre
MOW	:	Ministry of Works
PMO-RALG	:	Prime Minister's Office Regional Administration and Local Government
PS	:	Permanent Secretary
R&D	:	Research and Development
SC	:	Steering Committee
TANROADS	:	Tanzania National Roads Agency
TC	:	Technical Committee

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1 Executive Summary

AFCAP2 is providing technical assistance to the Directorate of Infrastructure Development in the Prime Minister's Office: Regional Administration and Local Government of Tanzania, to achieve its objective of setting up a Local Government Infrastructure and Transportation Research Centre (LoGITReC) in Dodoma .

During 2014/15, a strategic plan for implementation of LoGITReC's research priorities in accordance with the National Transport Policy was developed. This plan addressed: (a) the vision, mission, goal and strategic objectives of LoGITReC; (b) governance issues, including the role and responsibilities of the Steering Committee, the institutional and physical location of LoGITReC, sources of funding, key performance indicators, and strategic relationships and linkages; (c) the short to longer term research agenda of LoGITReC, which future revisions will be guided by a Technical Committee, which also still has to be convened, and the establishment of specific internal and external technical committees and working groups; (d) capacitation of LoGITReC in terms of human resources and research infrastructure; and (d) establishing mechanisms for creating greater visibility of LoGITReC and for sharing/disseminating/demonstrating its achievements. In addition to the above, a budget was proposed, but this will have to be reassessed following the physical establishment of LoGITReC.

The objectives of this 12-month Technical Assistance programme to LoGITReC are as follows:

- 1) to make further progress with priority activities for the establishment and operationalisation of LoGITReC; and
- 2) to achieve the key performance indicator targets set out in the LoGITReC Strategic Plan for the first year of operation.

This report outlines the progress that has been achieved between October and December 2015.

2 Long and Short-Term Objectives

The objectives of the Technical Assistance programme to the Tanzania Local Government Infrastructure and Transportation Research Centre (interim Phase) are as follows:

1. to make further progress with priority activities for the establishment and operationalisation of LoGITReC; and
2. to achieve the key performance indicator targets set out in the LoGITReC Strategic Plan for the first year of operation (see Table 1 below).

Table 1: Critical Success Factors, Key Performance Indicators and Targets for LoGITReC¹

Critical Success Factors	Key Performance Indicators	Targets				
		Year 1	Year 2	Year 3	Year 4	Year 5
R&D portfolio efficiency and effectiveness	No. of DRRTC meetings held	2	4	4	4	4
	Compliance with DRRTC directives	100%	100%	100%	100%	100%
	% of projects in active breakthrough vs. incremental projects	0%	100%	100%	80%	60%
	No. of research projects in active development	2	4	6	8	12
	No. of research projects successfully completed	0	2	3	5	9
	No. of research projects secured with private sector funding	0	0	1	2	4
	Value of projects supported by Development Partners as % of total	N/A	Report	Report	Report	Report
	% Milestones met (i.e. % R&D objective achievements)	100%	100%	100%	100%	100%
	Released vs. planned deliverables (%)	N/A	100%	100%	100%	100%
	Portfolio yearly spending against budget (%)	100%	100%	100%	100%	100%
	Cost savings attributable to R&D	N/A	Report	Report	Report	Report
Stakeholder satisfaction with research outcomes	N/A	70%	75%	80%	80%	
Ensuring effective transfer of technology to practice	No. of conference papers presented	2	5	8	10	14
	No. of journal articles published	0	1	2	3	4
	No. of industry workshops and dissemination fora held	2	4	6	8	8
	No. of courses held (incl. Technical Assistance programme)	0	3	4	5	5
	No. of industry guidelines and manuals published	0	1	2	3	3
	No. of norms and standards published	0	0	1	2	2
Strengthening the skills base of the RRC	No. of demonstration projects successfully completed	0	1	3	5	7
	No. of Doctorates	1	1	2	2	3
	No. of Masters	1	2	2	3	3
	No. of staff classified as researchers	3	5	7	9	11
	No. of laboratory technicians in Dodoma	4	6	6	12	15
	No. of laboratory technicians in Regional Laboratories	0	20	50	68	100
	No. of staff registered as professionals	1	2	3	4	6
	No. of staff studying towards a PhD	0	0	1	1	2
	No. of staff studying towards a Masters	0	1	1	2	2
	No. of studentships/interns	0	2	3	4	4
No. of staff inducted at international R&D centres	0	1	2	2	2	
Ensuring good governance	Average % time spent by research staff on R&D projects	50%	50%	55%	60%	60%
	Average % time spent on capacity building	20%	15%	10%	5%	5%
	Average % time spent on industry events (e.g. workshops)	5%	10%	10%	10%	10%
	No. of DRRTC meetings held	3	3	2	2	2
	Compliance with DRRTC directives	100%	100%	100%	100%	100%
	Adherence to standards of good corporate governance	100%	100%	100%	100%	100%
	ISO 9000 quality system implementation	-	initiate	initiate	certify	compliance
Adherence to health, safety and environment standards	100%	100%	100%	100%	100%	
Collaboration with other public entities (e.g. CML): No. of projects	2	3	4	4	5	
Collaboration with universities: No. of projects	0	1	2	3	3	
International R&D collaboration: No. of MoUs signed	2	3	4	6	6	

¹ Table extracted from the Road Research Strategic Plan in which LoGITReC was still referred to as the DRRC.

The services that will be provided over the 12-month period are described in the Terms of Reference. They include:

- 1) To meet with the manager of LoGITReC to review progress with priority activities for the establishment of the research centre and achievement of the Key Performance Indicator targets (as set out in the Strategic plan);
- 2) To formulate and implement prioritised 'quick win' projects, with particular focus on the monitoring of all trial sections that were constructed under AFCAP 1 and establishment of knowledge management databases.
- 3) To identify specific areas of support needed to resolve constraints to the achievement of priority activities and targets and provide this support where possible; this may include (amongst others):
 - Assistance with the organisation of steering committee meetings;
 - Assistance with the organisation technical committee meetings;
 - Preparing staff job descriptions;
 - Assessing candidates for research posts;
 - Identifying IT requirements and preparing specifications for procurement;
 - Design of knowledge management databases;
 - Identifying laboratory and site testing equipment requirements and preparing specifications for procurement;
 - Preparing TORs for research projects, identifying funding, and appointing consultants as necessary;
 - Preparing TORs for research projects, identifying funding, and appointing consultants as necessary;
 - Identifying suitable conferences and preparing abstracts and papers;
 - Identifying appropriate topics for industry workshops and arranging venues, speakers, facilitators etc.;
 - Assisting with the organisation of knowledge sharing events for example field visits and study tours;
 - Identifying and contacting other public entities and drafting collaboration agreements;
 - Identifying appropriate international organisations, making contact and drafting Memoranda of Understanding;
 - Identifying and maximising opportunities for research centre participation in relevant programmes and activities being implemented by the host organisation.
- 4) At the end of the assignment, to revise and update the existing LoGITReC Strategic plan in collaboration with the research centre management.
- 5) To prepare an inception report, brief progress reports every two months, and a final report at the end of the assignment.

In the Inception Report for this project, the following activities were planned for the period October to December 2015:

- Appraisal of the status quo, identification of priorities and drafting of Inception Report (first trip to Tanzania, October).
- Review of laboratory layout and equipment purchased, and assessment of additional equipment and laboratory database requirements (November, 1st week).

- Review of all previous documentation available on the road trials in the Bagamoyo and Siha Districts (week 2 of November).
- Second trip to Tanzania (3rd or 4th week of November – one week):
 - Discussion/agreement on laboratory layout, additional equipment requirements and laboratory database options;
 - Scheduling of first meetings of the DRRTC and DRRSC, and assistance with the organisation thereof;
 - Preparation of, and agreement on job descriptions and training requirements;
 - Development of a Skills Development and Capacity Building Plan, inclusive of potential secondments to international research organisations;
 - Identification of potential topics to be submitted to conferences and assistance in the preparation of abstracts;
 - Collect all available data on the road trials in the Bagamoyo and Siha Districts²;
 - Hold meetings with PMO-RALG, Tanroads (and CML) to determine the level and quality of information available on the mapping of aggregate resources;
 - Identification of collaborative partners both within Tanzania and internationally with whom PMO-RALG should enter into agreements.
- Scheduling of interactions to be held between CSIR Knowledge Management and IT specialists and their counterparts in PMO-RALG (1st week of December).
- Drafting and submission of Concept Notes and proposals (1st and 2nd week of December):
 - Capacity building;
 - Continued monitoring of the road trials in the Bagamoyo and Siha Districts;
 - Laboratory capacitation (additional equipment and laboratory database requirements).
- Draft quarterly report (December).

Progress against the above objectives and activities are outlined in the sections below.

² Only for the purpose of warehousing the data. The mapping of data and the processing and analysis thereof will form part of a separate project informed by the Concept Note that will be developed.

3 Progress on Short Term Objectives (October to December 2015)

3.1 Inception Phase

During the Inception Phase meetings were held during October 2015 in Dodoma and Dar es Salaam with, among others:

- The Ministry of Works: Eng Light Chobya (Assistant Director Trunk Roads) and Eng John Ngowi (Assistant Director Regional Roads);
- The Acting Permanent Secretary of PMO-RALG: Mr Kharist Luanda (Director Local government, PMO-RALG);
- Eng Kayanda (Director of Infrastructure Development, PMO-RALG); and
- Dr Fikiri Magafu (Assistant Director: Planning and Research, PMO-RALG) and
- Eng Vincent Lwanda (Manager of LoGITReC Laboratory, PMO-RALG).

The discussions centred on the prioritisation of needs and the development of action agendas for the following:

- Priority research and development projects, which include the following:
 - Development and implementation of design methods for low-volume roads;
 - Road trials, demonstrations and monitoring;
 - Optimisation of delivery methods for the maintenance of local government roads;
 - Use of local and alternative materials in roads.
- Establishment of LoGITReC:
 - Steering and Technical Committees;
 - Structure of LoGITReC;
 - LoGITReC laboratory and staff;
 - LoGITReC Research Staff;
 - Knowledge management;
 - IT requirements;
 - Permanent offices for LoGITReC.

The outcomes of the above, inclusive of the Action Agenda for the 12-month Technical Assistance Programme and expected outcomes are provided in the Inception Report dated October 2015.

3.2 Capacity Building and Skills Development Action Plan

During November 2015, a draft Capacity Building and Skills Development Action Plan was developed. This plan was further updated during December 2015, following discussions held with Eng Mataka of CML/Tanroads and Dr Magafu and Eng Lwanda of LoGITReC/PMO-RALG. The draft Plan addresses the following:

- The Research Career Ladder;
- Capacity building, inclusive of short to medium-term staff requirements and a staff recruitment and retention plan;
- Skills development, inclusive of career development plans, induction programmes and mentorship programmes;
- Training requirements, both informal and formal;

- Secondments to other institutions to accelerate skills development.

It should be noted that most of the above items are still in a “conceptual” phase, awaiting confirmation on the actual human resource base that will form part of LoGITReC. This said, the draft Capacity Building and Skills Development Action Plan provides valuable additional information, including the following:

- A Good Research Practice Guide for LoGITReC researchers; and
- A Good Practice Guide for research laboratories.

As part of the above document, the current status with respect to staff recruitment and training of laboratory are also addressed. The below are extracts from this document:

Status Report: Staff Recruitment:

In October 2015, LoGITReC’s Planning and Research Group had four researchers, including the Head of LoGITReC (Dr Magafu). However, two of the researchers have been reassigned and therefore are no longer available to LoGITReC. It should also be noted that the research team has not yet been involved in directed research activities, although some of the researchers were involved in the latest assessment of the road trials in the Bagamoyo and Siha Districts. The research team has mainly been involved in other activities, including design vetting.

A plan has been put in place to recruit one experienced engineer and at least two young engineers for the Planning and Research Group of LoGITReC. The young engineers will be recruited through the Association of Local Government Engineers of Tanzania (ALGETA)³.

LoGITReC’s Laboratory is headed by Eng Lwanda and currently has five technicians. The technicians have already undergone some basic training offered by the regional laboratory of Tanroads but further training will be required.

The current staff composition of LoGITReC is shown in the table below (note the comment below the table):

NAME	GENDER	TITLE	AGE	QUALIFICATION	YEAR OF EXPERIENCE
<i>Eng. Dr. Fikiri Magafu</i>	<i>Male</i>	<i>ADPR</i>	<i>41</i>	<i>PhD</i>	<i>15</i>
<i>Justine Lyatuu (*)</i>	<i>Male</i>	<i>Economist</i>	<i>48</i>	<i>Economist</i>	<i>11</i>
<i>Eng. Emily Kagaigai</i>	<i>Male</i>	<i>Principal Mechanical Engineer</i>	<i>56</i>	<i>MSc (Mechanical Engineering)</i>	<i>18</i>
<i>Eng. Nyariri Nana (*)</i>	<i>Male</i>	<i>Civil Engineer</i>	<i>38</i>	<i>BSc (Civil Engineering)</i>	<i>13</i>
<i>Vincent Lwanda</i>	<i>Male</i>	<i>Laboratory Manager</i>	<i>44</i>	<i>BEng (Civil)</i>	<i>16</i>
<i>Ahsante Kamba</i>	<i>Female</i>	<i>Civil Eng. Technician</i>	<i>39</i>	<i>Full Technicians Certificate (Highway Eng.)</i>	<i>13</i>
<i>Nassoro Sulemeni Juma</i>	<i>Male</i>	<i>Civil Eng. Technician</i>	<i>28</i>	<i>Ordinary Diploma - Civil & Transportation Engineering</i>	<i>1</i>

³ On 27 November 2015, Dr Magafu contacted the Association of Local Government Engineers of Tanzania (ALGETA) to enquire whether District and/or Municipal engineers would be interested in joining LoGITReC. Two district engineers responded the same day, indicating their interest.

NAME	GENDER	TITLE	AGE	QUALIFICATION	YEAR OF EXPERIENCE
Peter Mkumbo	Male	Civil Eng. Technician	31	Full Technicians Certificate (Civil)	8
Jacob Manguye	Male	Civil Eng. Technician	57	Full Technicians Certificate (Civil)	35
Geoffrey Mbunda	Male	Civil Eng. Technician	36	Ordinary Diploma - Civil Engineering	6

(*) Have been reassigned since October 2015 and are no longer be available to LoGITReC

Status Report: Training:

The five laboratory technicians have been trained by the Tanroads Regional Laboratory in Dodoma on both the theory and practical execution of a range of road material test methods. The training was executed over a period of four weeks, focussing on the following test methods (cf. Annex D of the Draft Capacity Building and Skills Development Action Plan):

- Moisture content determination (2 days);
- Liquid limit determination (2 days);
- Plastic limit and plasticity index determination (2 days);
- Linear shrinkage determination (1 day);
- Particle size distribution through wet sieving (2 days);
- Dry density – moisture content relationship (both light and BS heavy) (3 days);
- California bearing ratio (CBR) one-point method (2 days);
- CBR three-point method (1 day);
- Moisture content of aggregates (2 days);
- Relative density and water absorption of aggregates (2 days);
- Sieve tests on aggregates (2 days);
- Flakiness index (FI) and average least dimension (ALD) determination (2 days);
- Elongation index determination (1 day);
- Aggregate Crushing Value (ACV) determination (1 day).

Although the laboratory technicians gained some good experience, they noted that further knowledge strengthening was required urgently. Furthermore, the technicians only received basic training on the 15 test methods listed above. There are several additional test methods appropriate to the evaluation of soils and aggregate, as well as modified/stabilised materials, which were not covered in the four-week course. These are also listed in Annex D of the Draft Capacity Building and Skills Development Action Plan and marked as “urgently needed”.

Immediate Training Needs:

Further training of the laboratory technicians is required urgently. There are three options that could be considered:

1. **Training of laboratory staff at the Dar es Salaam Institute of Technology:**
The Institute is willing and prepared to provide one-month training to the laboratory staff of LoGITReC at a cost of Tsh 3 million per person. There are two advantages linked to this approach: (1) not all five technicians need to be trained at the same time, i.e. three staff members could be trained in month 1, and two in, say, month 3; and (2) the technicians will be issued with a certificate indicating their proficiency in executing certain test methods.

2. *Training at CML:*
CML is equally willing to train LoGITReC laboratory staff over a period of one month in their central laboratory in Dar es Salaam. They are prepared to train up to 12 technicians at a total cost of Tsh 40 million. CML will also issue certificates indicating the proficiency of the technicians for specified test methods⁴. The main advantages associated with this option are that: (1) CML has extensive experience in the use of the Tanzanian standard laboratory test methods and (2) the repeatability and reproducibility of test methods and results can be assessed. One drawback is that the cost is a constant, irrespective of the number of trainees attending the course. This then also implies that all five technicians will have to be trained at the same time.

3. *Dedicated training at the laboratory in Dodoma by a materials testing specialist:*
The third option may be attractive in that the training can be provided on the premises of LoGITReC in Dodoma, therefore enabling the trainees to use the same testing equipment that they will be using in future when the laboratory is fully operational. Certificates of proficiency in testing could be issued, as long as the trainer is an accredited service provider. Although difficult to quantify at this stage, it is expected that the costs of this option could be higher than those of options 1 and 2, especially for a month of dedicated training, which might be a drawback.

Although further discussions have already been held with CML, similar discussions still need to be held with the Dar es Salaam Institute of Technology, also to explore the possibility of providing training in Dodoma instead of Dar es Salaam. However, the provision of the training in Dodoma requires that the laboratory is fully established and that all essential equipment is available for the training of the technicians. The issues associated with laboratory establishment and equipment are addressed in Annex E of the Draft Capacity Building and Skills Development Action Plan. These are summarised below:

Laboratory establishment:

- A sample storage facility needs to be erected, fitted with large, heavy duty shelves;
- A sample preparation and drying area should be prepared;
- Sufficient water basins (possibly also a soaking tank) need to be provided inside the laboratory, all fitted with a sand trap;
- Ideally, noisy and dust generating equipment/operations should be isolated;
- Sufficient storage (shelves, cupboards, drawers) needs to be provided inside the laboratory to safeguard testing and auxiliary equipment. This will also contribute to a greater efficiency and effectiveness of laboratory operations;
- Equipment needs to be mounted (e.g. compaction platform, sieve shaker, etc.);
- Software and databases supporting laboratory management and operations need to be developed or acquired⁵.

Additional laboratory equipment required:

- 500kN compression testing machine enabling the laboratory to measure UCS, ACV, 10% FACT and concrete cube strength;

⁴ On 27 November 2015, Eng Mataka of CML recommended that the one-month training period be devoted to the testing of unbound materials. Testing of stabilised materials should form part of a separate training course.

⁵ CML also does not yet have such systems in place, and are willing to contribute to the development or acquisition thereof in joint partnership with LoGITReC, to the benefit of both laboratories.

- Triaxial cell;
- At least one additional oven;
- 50 kg balance, readable to 5g;
- Balance readable to 0.01g;
- Vibrating table (concrete cubes);
- Riffle box (small size);
- Linear shrinkage moulds;
- Vacuum desiccator and pump;
- Thermometers;
- Heat protection gloves and earmuffs or earplugs.

In addition to the above, the laboratory should also be able to test bituminous binders and mixes in order to serve the testing needs of towns and cities, and also be able to support the upgrading of gravel roads to paved standards.

During December 2015, the CSIR obtained quotations from four laboratory equipment suppliers for the additional laboratory equipment required. These quotations were sent to Dr Fikiri of LoGITReC for evaluation.

3.3 Concept Notes for Priority Projects

Based on discussions held in October and November 2015 with PMO-RALG, the Ministry of Works and CML of Tanroads, the following two Concept Notes were drafted in December 2015 (see Annex A):

- Continued Monitoring of Existing Road Trials and Establishment of New Road Trials; and
- National Road Material and Aggregate Inventory Database

Both Concept Notes have been sent to Eng Leta of AfCAP and Dr Magafu of LoGITReC/PMO-RALG, and the Concept Note on the establishment of a *National Road Material and Aggregate Inventory Database* has also been sent to Eng Mataka of CML/Tanroads for their comments.

A Concept Note / Proposal for the Capacitation of the LoGITReC Laboratory, inclusive of staff training, will be drafted in January after receipt of comments from Dr Magafu and Eng Leta.

3.4 Other Activities

It has been agreed that the first Technical and Steering Committee meetings will be held in early February 2016. Letters have been sent to the proposed membership of both Committees by Dr Magafu, and PMO-RALG is following up with each proposed Member to confirm their membership. When this process has been finalised, formal invitation letters will be sent to the confirmed membership of both Committees. Draft agendas for the first meetings of both Committees are provided in Annex B.

One abstract for a paper has been prepared and submitted to the organisers of the International Conference on Transport and Road Research to be held in Kenya in March 2016. The abstract is reproduced in Annex C.

With respect to the identification of collaborative partners both within Tanzania and internationally with whom PMO-RALG would enter into formal agreements with, PMO-RALG

has already initiated discussions with three Tanzanian universities. These discussions will be formalised in February 2016. With respect to international partners, PMO-RALG has indicated that they would like to enter into a formal agreement with the CSIR first, before engaging with other partners internationally.

4 Planned Activities and Deliverables for Second Quarter

4.1 Activities

The following activities are planned for the period January to March 2016:

- Provision of assistance with the setting up of the DRRTC and DRRSC meetings, inclusive of presentation material for the first meeting of both committees⁶ (January).
- Finalisation of Concept Note / Proposal on *Capacitation of the LoGITReC Laboratory (inclusive of training of laboratory staff)* .
- Third trip to Tanzania (early February – one week):
 - Participation in the first meetings of the DRRTC (on a Tuesday) and DRRSC (on a Friday);
 - Hold further discussions with collaborative partners in Tanzania with whom PMO-RALG will enter into agreements with, and agree on the format of agreements;
 - Identification of topics for national workshops and assistance with the organisation thereof (i.e. provision of broad guidelines);
 - Interactions between CSIR Knowledge Management and IT specialists and their counterparts in PMO-RALG to initiate the mapping of knowledge management and IT requirements, and reporting on the outcomes of these meetings⁷.
- Oversee the final approval and implementation of projects: (a) capacity building of LoGITReC staff; (b) monitoring of road trials in the Bagamoyo and Siha Districts; (c) mapping of aggregate resources for road construction (National database (March)).
- Based on the outcomes of the meeting of the DRRTC, draft three Concept Notes for (a) research and development activities on community-based contracting; (b) the development of associated guidelines for stone/timber bridges and segmented pavement design and construction; and (c) research and development of alternative materials for application on low-volume access roads (March).
- Draft quarterly report (March).

4.2 Deliverables

The Technology Assistance programme is expected to produce the following deliverables in the Second Quarter (January to March 2016):

- Concept Notes (and/or proposals) for: (a) Laboratory Capacitation; (b) research and development activities on community-based contracting; (c) the development of associated guidelines for stone/timber bridges and segmented pavements design and construction; and (d) research and development of alternative materials for application on low-volume access roads;
- Status report on progress made on the initiation of research projects and the establishment of LoGITReC;
- Report back on the outcomes of the first meetings of the Technical and Steering Committees; and
- Second Quarterly Progress Report

⁶Inclusive of presentation material on community-based contracting (and the development of associated guidelines for stone/timber bridges and segmented pavements) and alternative materials for deliberation at the meeting of the DRRTC.

⁷ Meetings are to be held in Dar es Salaam.

5 References

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Annex A: Draft Concept Notes

PROJECT CONCEPT NOTE

Project Title: Continued Monitoring of Existing Road Trials and Establishment of New Road Trials
Country/Countries/Region: Tanzania, Bagamoyo and Siha Districts
Project Background: <p>A number of road trials have been constructed in Tanzania, supported by AfCAP, which were designed to demonstrate and verify different options in design, material utilisation and construction methods for particularly low-volume roads. Examples of these include:</p> <ul style="list-style-type: none">• Bogo to Talawanda road in the Bagamoyo District of the Pwani Region• Lawate to Kibongoto road in the Siha District of the Kilimanjaro Region <p>A review of the outcomes of all road trials constructed in Tanzania will be necessary. Some of the road trials have been monitored over a period time and should therefore have good as-built information and performance data available that can be used as a benchmark to assess future performance.</p> <p>However, the available performance data may not always be consistent between projects and over the monitoring periods. Also, the establishment of these road trials may not necessary have been geared towards providing sufficient data that will enable researchers to assess the full impact of all factors that can influence the performance of pavements (incl. traffic and environmental data). Hence, the extraction of information for back analysis may be difficult without a framework for guidance. It is therefore necessary that a protocol for establishing and monitoring trial section to guide the collection of the required data, including consistent condition assessments of the road trials, is developed to ensure proper analysis.</p> <p>There is thus a need to evaluate the existing road trials in order to determine the quality of monitoring data, and to identify which road trials are worth monitoring for a further period of time and which should not. To effectively undertake such a research project, it is therefore necessary to have a systematic method of evaluation and monitoring in place for the existing as well as new road trials, which will include condition assessment over a number of years.</p> <p>This Concept Note is for the development of a framework for assessing the quality of data obtained from existing road trials, for the establishment of new road trials and for the systematic collection and recording of condition and performance data generated during the monitoring period of road trials. The Concept Note describes the elements, approach and resources required to carry out the project.</p>
Concise Project Purpose: The goal of the project is the assessment of the outcomes of existing road trials, the continued monitoring of existing road trials as well as the establishment of new road trials and the development and implementation of protocols for establishing and monitoring road trials in a systematic way. In

order to achieve this goal, the project has been subdivided into three main tasks with specific activities as outlined in the Project Methodology section of this Concept Note.

The objective of the **first** task is to evaluate the nature and quality of information available from existing road trials. An in-depth review (including an updated back-analysis) of the existing road trials will be undertaken. The objective of the **second** task of the project is to develop guidelines/protocols to ensure that the establishment of road trials and collection of the information is standardised. The objective of the **third** task is to establish new road trials, and to collect data on the old and new road trials on a continuous basis over a number of years according to the monitoring processes provided in the guidelines/protocols developed as part of Task 2.

Previous or Related Work:

The Prime Minister's Office – Regional Administration and Local Government (PMO-RALG) set up the Local Government Transport Programme (LGTP) in 2007 with the aim of supporting rural development and poverty alleviation. In 2009, AfCAP was requested by PMO-RALG to assist with the implementation of demonstration road sites in Tanzania.

Two sites were selected in the Bagamoyo and Siha districts, located on the Bango to Talawanda road in the Bagamoyo District (about 20.3 km) and on the Lawate to Kibongoto road in the Siha District (about 13 km). Both sites were found to be ideal to demonstrate the types of challenges that can be overcome using Environmentally Optimised Design (EOD) and the Spot Improvement (SI) philosophy.

Two groups of surfacing options were identified and used on the two project roads. The first group comprised bituminous surfacing options, such as Otta seals with sand cover seal, slurry seals, double sand seals, double surface dressings and bituminous penetration macadam. The second group comprised non-bituminous surfacing solutions, such as concrete strips, concrete geocells, hand packed stone, concrete paving blocks, as well as unreinforced and lightly reinforced concrete.

The designs for the sections at Bagamoyo were based on the Tanzanian Pavement and Materials Design Manual (TPMDM), with modifications made to obtain an environmentally optimised design that is suitable for low-volume roads. Construction of the sections was completed in September 2011, baseline data were collected by October 2011, with subsequent monitoring visits carried out in April 2012, September 2012 and April 2013.

The designs at Siha were based on the Dynamic Cone Penetrometer (DCP) method in order to allow designs that only have one pavement layer below the surfacing. Construction was completed in September 2012, baseline data were collected by January 2013, with one monitoring visit carried out in April 2013.

An additional year of monitoring was done by the service provider as an extension to their original contract with AfCAP, after which one additional monitoring visit to both road trials was carried out by PMO-RALG and the Central Materials Laboratory (CML) of Tanroads, involving District engineers. The latest set of performance data has not yet been analysed.

Project Methodology:

It is recommended that the proposed project be undertaken as outlined below (note that all three tasks can be conducted concurrently, inclusive of the establishment of new road trials forming part of Task 3):

TASK 1: Review of existing road trials:

Main activities to include:

- Extensive review of all existing road trials. This includes the identification of all road trials that have already been built in Tanzania and to assemble all available data, including all construction/as-built documentation, performance data and any back-analysis studies carried out.
- Assessment of the accessible information on the road trials. It should be noted that data collected from the different road trials may not be in the same format. The analysis of these data should provide the research team with a better understanding of the data collection methods used and also assist in decision-making on whether all existing sections should be included as candidates for further monitoring. Hence, the gathering of additional as-built information (i.e. baseline data) where such information is not available or found to be unreliable should also be conducted as part of this task.
- In-depth review of a sample of ongoing road trials, including a back-analysis where required. It is advisable to conduct this review to compare as-built data with the original final designs to establish reliability of information. Information should be validated with those who have been involved in the projects.

TASK 2: Development of guidelines/protocol for establishing and monitoring road trials

- Review and analysis of all available national and international guidelines and protocols on the establishment and monitoring of road trials: these guidelines and protocols will provide the required information to develop local guidelines for the establishment of road trials and data collection, which should be based on best proven practices. It should be borne in mind that different protocols are required for different types of road investigations, e.g. structural design, materials usage, surfacing types, traffic loading evaluation gravel loss on unpaved roads, drainage effectiveness and societal impacts.
- Evaluation of data collection methods: the method of data collection is critical for future back-analysis in order to achieve the objectives of the project. The appropriateness of the format for data collection should be evaluated against best practices. This task should involve peer review of the identified data elements. This is vital because monitoring data can prove to be almost worthless unless certain rules are followed.
- Drafting of guidelines/protocols: work is to focus on the development of the draft guidelines/protocols based on the review of existing guidelines/protocols. The research team should further examine, improve, and finalise the structure and embark on the development of the guidelines/protocols taking into account the variability of the data formats.
- Finalisation of the guidelines/protocols: existing and new road trials will be used for testing the protocols for monitoring the sections. The exercise should provide insight into the process. The guidelines/protocols will establish a benchmark for basic levels of managing the monitoring process of road trials.

Task 3: Establishment of new road trials and ongoing monitoring of existing road trials

- New road trials will have to be established as a matter of priority, especially since the Local Government Infrastructure and Transportation Research Centre (LoGITReC) of PMO-RALG has funding available for the construction of approximately 3 km of road trials in their budget for the 2015/16 financial year. The establishment of these road trials will involve the following (inter alia):
 - A review of likely candidate materials needs to be carried out and suitable materials identified. A programme of laboratory testing and evaluation should then be carried

out and material sources that are deemed most suitable should be selected for trials;

- Define the desired outputs/outcomes, and plan project activities accordingly;
 - Identify a suitable location for the road trial and assess local conditions (site investigations);
 - Develop concept, preliminary and final designs for each experimental section that will form part of the road trial;
 - Develop a detailed monitoring and assessment programme, also specifying baseline data requirements;
 - Following the procurement process, construct the experimental sections while implementing a rigorous quality control system, also to capture all as-built data;
 - Set baseline data and implement the performance monitoring plan.
- Devise a programme schedule for the continued monitoring of the trials. Simple analysis of the data should be carried out after each monitoring activity, but the main analysis will take place when the trials have been monitored for long enough for the durability and long-term performance of the trials to be assessed reasonably accurately. This can be a relatively complex task and it is likely that in the early stages of the development of LoGITReC expert technical assistance may be required.

The establishment and the commitment of resources to a long-term monitoring strategy of the road trials will be critical to achieving the objectives of the project. The period of monitoring may be project specific, but guidance will be provided in the developed guidelines/protocols. The monitoring of the performance of the road trials should be over a period of at least two years for unpaved roads and 5 years for paved roads. Climatic conditions may dictate the frequency of performance data collection.

Human Resources ReCAP Funded:

A service provider should be appointed with specialist knowledge on all aspects of long-term performance assessments of experimental sections / road trials, inclusive of: the planning, design and construction of sections; the setting up of a monitoring programme; the establishment of baseline data; performance monitoring of the sections (incl. the capturing of traffic and environmental data); data management (incl. capturing, validation and storage of data in a fit-for-purpose database); data processing and analysis; and reporting formats.

The service provider will assist the research team in the successful completion of the first two tasks outlined in the section "Research Methodology", as well as the initiation of the third task over at least one of the monitoring periods for the existing road trials, but also including assistance with the establishment of new road trials and, ideally, the first monitoring cycle of these newly established road trials.

One of the key responsibilities of the service provider is to transfer knowledge and expertise to Tanzanian engineers involved in the design, construction and performance monitoring of road trials. This capacity building and training programme will have to involve engineers from PMO-RALG, CML and especially staff from LoGITReC, as well as university students willing to be involved in this project as part of their post-graduate studies. This programme should include specialist advice/guidance, hands-on training on site, workshops, as well as training courses presented to PMO-RALG (inclusive of District engineers), CML and Tanroads staff at a central location (e.g. Dar es Salaam or Dodoma).

It will be expected that the service provider will spend 100 days (20 weeks) of productive time in-country (in Dodoma and Dar es Salaam and in the Bagamoyo and Siha Districts, predominantly) to provide specialist support and build local capacity, and 15 days (3 weeks) outside the country over a

period of 24 months. The time spent outside the country should be devoted to the compilation of reports (i.e. Inception Report, progress reports, workshop and training reports and Final Report) as well as the preparation of workshop and training material.

Parallel Resources – non ReCAP Funded:

It is envisaged that two (but ideally three) researchers, who are individuals employed by LoGITReC and/or CML of Tanroads, will undertake the work, supported by at least two technicians. The project should be led by a senior researcher who should be an individual with a background in research, preferably on the assessment of road performance, in addition to being an experienced pavement engineer or materials specialist. Preferably, the other researcher(s) should have at least a Bachelor degree in engineering.

It would be essential that the researchers involved in this project liaise with CML and staff from the Bagamoyo and Siha Districts that have been involved in the construction and performance monitoring of the road trials. Other parties involved in the establishment of road trials, such as consultants and contractors, should also be consulted.

Experienced field technicians would also be required, together with laboratory and field testing staff/labour. They should be sourced from LoGITReC and CML. The field technicians should be experienced in routine and specialised field testing to support the research team in gathering and capturing quality data on the composition and performance of the road trials, as well as on traffic and environmental factors (i.e. weather data).

Other Resources:

The project team needs to identify and characterise the field equipment that has been used in the past to assess the condition of existing road trials. This is important since all future investigations of the road trials have to make use of the same equipment in order to be able to relate past measurements to future ones, and therefore be able to characterise the evolution of pavement performance over time. The above equally applies to all monitoring methods and techniques that have been used on road trials in the past; all future monitoring needs to be based on the use of the same principles and equipment.

One of the outcomes of Task 2 (*Development of protocols/guidelines*) is expected to be specified evaluation methods and equipment that will have to be deployed for the condition assessment of all future experimental/trial sections on low-volume roads. This might necessitate the procurement of additional equipment. Hence, provision should be made for the acquisition thereof.

Project Outputs, Impacts, & Uptake Strategy:

The deliverables from this project will be short to long term. The estimated time to completion after commencement of project is indicated for each main task. This will however be influenced by the availability of the required skills:

- **Task 1:** Review of existing road trials, inclusive of additional testing and back-analyses where required (approximately 6 months);
- **Task 2:** Development of guidelines/protocols: The core outputs of this task will be guidelines/ protocols for the establishment of the trial/demonstration sections, systematic collection and recording of data generated during the monitoring period of the sections, including quality assurance of data. This task could be done in parallel with Task 1 (approximately 5 months);
- **Task 3:** On-going activities on established and new road trials for monitoring (and updating) information for back-analysis (longer term: at least 48 months)

On-going revision of the guidelines/protocols is required following their implementation through their actual use on road trials, based on a thorough assessment of feedback received, in order to improve the guidelines/protocols. It is expected that processed information obtained from road trials will be used to promote the wider implementation of successful road products and/or methods of construction and will assist in developing or improving specifications.

Relevant AfCAP Logical Framework Indicators:

- **Impact Indicator 3:** Proportion of classified network that is paved
- **Outcome Indicator 1:** ENGINEERING: National policies, manuals and documents approved and published
- **Outcome Indicator 4:** Concrete example of change influenced by AfCAP applied to #km of road
- **Outcome Indicator 5:** Affordable solutions
- **Output Indicator 2.1:** % of Projects led by Africans

Key Contacts:

Prime Minister's Office – Regional Administration and Local Government (PMO-RALG):

- Director of the Infrastructure Directorate: Eng Elina Kayanda
- Assistant-Director and Head of LoGITReC: Dr Fikiri Magafu
- Bagamoyo and Siha District Engineers (Eng Samson Kalesi and Eng Meleck Silaa were involved at the time of construction of the road trials in Bagamoyo and Siha)
- Other PMO-RALG staff associated with the road trials

Central Materials Laboratory of Tanroads:

- Manager: Eng Mussa Mataka
- Staff involved with the road trials: Eng John Malissa and Salahe Juma

International experts who were involved and/or contributed to the monitoring of previous road trials:

- Victor Rogers, Ramsey Neseiyif and Simon Gillett (Roughton International Ltd)

Key References:

Roughton International Ltd. 2013. Design and Construction of Demonstration Sites for District Road Improvement in Tanzania: Final Report. AFCAP/TAN008.

Roughton International Ltd. 2013. Design, Construction and Monitoring of Demonstration Sites for District Road Improvement in Tanzania: Bagamoyo Final Monitoring Report. AFCAP/TAN008.

Roughton International Ltd. 2013. Design, Construction and Monitoring of Demonstration Sites for District Road Improvement in Tanzania: Siha Final Monitoring Report. AFCAP/TAN008.

Roughton International Ltd. 2013. Design, Construction and Monitoring of Demonstration Sites for District Road Improvement in Tanzania: Workshop Report. AFCAP/TAN008.

Roughton International Ltd. 2012. Design, Construction and Monitoring of Demonstration Sites for District Road Improvement in Tanzania: Sociology Report. AFCAP/TAN008.

Concept Note Submitted by: B Verhaeghe on behalf of the Local Government Infrastructure and Transportation Research Centre (LoGITReC)

Organisation: Prime Minister's Office – Regional Administration and Local Government (PMO-RALG)

Date: December 2015

Concept Note Reviewed by (PMU)

Date:

PROJECT CONCEPT NOTE

Project Title:

National Road Material and Aggregate Inventory Database

Country/Countries/Region:

Tanzania

Project Background:

The effective planning and costing of road maintenance and road construction is affected by the proximity of sources of good materials as well as readily available information of the properties of these sources. Over the years, the Tanzania National Roads Agency (TANROADS), the Central Materials Laboratory (CML) and consultants have acquired information on the location and properties of road construction materials from projects undertaken in many parts of Tanzania. This information needs to be centralised in order to be put to effective use for planning and costing of possible material usage in adjacent future projects and for maintenance and rehabilitation.

Locating good construction materials especially when sources of good material are limited often has significant cost implications on a project. Several roads have over the years been constructed in Tanzania, including experimental sections that have been monitored and should therefore have information on material sources and properties. Although this information is available, it appears that a lot of this data is mostly contained in reports and therefore is not readily available, user friendly or in a format for an effective useful materials data base system. Ultimately, a system needs to be developed for Tanzania that will provide locations of potential materials sources with their typical properties and post-construction performance.

As in the case of most countries, the presence of good construction materials is diminishing, the art of material location is slowly being lost and environmental constraints and requirements are all hindering the timeous location of materials for construction. This often results in delays on construction projects, increasing costs.

The mapping of suitable materials for road construction should not be limited to materials that meet traditional specifications, namely those that are typically used for roads carrying medium to high volumes of traffic. Local materials, despite not conforming to traditional material requirements, can still perform satisfactorily and result in significant cost savings and environmental benefits, especially when used on low-volume paved and unpaved roads. Hence, all material sources that could potentially be used in roads should be mapped, inclusive of alternative materials such as industrial by-products.

Together with the mapping of the location of the materials, general testing should be carried out and a database of the sources and potential uses of the materials developed. Recommendations on how marginal materials could be rendered suitable for use in road construction (e.g. through blending, modification and/or stabilisation) should also be provided in the database.

This Concept Note describes the methodology for carrying out this work for one Region in Tanzania. Once this has been completed and the systems set up, the study should be extended to other Regions. Ultimately, a GIS-based map showing the likely locations and size of potential borrow pits or quarries with links to their typical properties and potential uses should be available for the entire country.

Concise Project Purpose:

This project aims to extend existing databases of potential resources and to develop Geographic Information System (GIS) maps to include these as well as additional resources, including marginal materials that have been used successfully or have the potential to be used in road construction.

The aim is also to identify the most appropriate methodologies to use for developing the database and GIS maps that will eventually become a national materials management system for Tanzania. The system is to contain existing road construction material information and potential sources of all possible materials, including information on quantities of available materials, their properties and their potential applications. Such information should be accessible to anyone who requires it for a project in a specific area.

The final aim is to fully capacitate staff at the Local Government Infrastructure and Transportation Research Centre (LoGITReC), District Engineers and staff of CML to undertake road material mapping studies to support the establishment of the national materials management system.

Previous or Related Work:

<<<CML to provide information on previous work carried out in Tanzania>>>

Project Methodology:

The available data collected from many projects over the years should be used as the starting point in the development of the national road material and aggregate database.

It should be noted that the basic system developed by TRL Ltd for Mozambique under AfCAP (see list of references) could also be consulted as a launching pad for the development of appropriate material location guidelines for Tanzania. The principles deployed for the location of calcrete deposits were sound, but they would have to be adapted for the location of other materials.

The project will be carried out in a number of phases.

- i. Carry out a survey amongst potential users of the database to determine what information they would ideally require. A good knowledge of the requirements of the different stakeholders will be necessary. The minimum data requirements should be established at this stage.
- ii. Review and provide a synthesis of all work carried out in Tanzania to date on the mapping of aggregate resources for road works.
- iii. Obtain, through literature scans and consultation, a thorough understanding of remote sensing, botanical or other indicator principles that can be applied in Tanzania to source suitable materials.
- iv. Obtain information from the TANROADS Regional Offices on all known borrow pits, their GIS coordinates, their geology, material properties and the quantity of materials that is potentially still available to be used for road works. Obtain similar information from all District engineers.
- v. Based on a qualitative assessment of the above information, the research team will then identify a District or several Districts to be used as a "pilot area" for this project. The research team will then need to visit the District(s) and carry out a detailed investigation of the local soils and geology, to confirm which of the techniques or principles employed works best for which materials. Field investigations will involve use of probes, test pitting and soil profiling, and sampling at selected sites showing potentially useful materials of any kind. Laboratory testing will include normal grading, Atterberg limits, CBR testing and aggregate strength (ACV, AIV, 10% FACT, etc). X-ray diffraction (XRD) studies of some of the materials may also be useful.
- vi. Based on the results obtained from the "pilot area", the optimum assessment techniques

should be identified. These must then be applied to a desk-study of a second selected area. Only those sites that show positive potential should then be evaluated and the success rate of the process determined. Areas that weren't successful should be investigated to determine "what went wrong"?

- vii. Once the process has been adequately fine-tuned, the entire Region should be "mapped" and sampled according to the method developed.
- viii. The results of the material location (inclusive of existing borrow pits) and sampling must then be placed in a database linked to a GIS such that anyone requiring material information in the Region can quickly access the available data. This database should include information on the potential use of the materials as well as potential treatments to render them suitable (i.e. for marginal materials).
- ix. Prepare a manual on the use of the system and the database including a method for users to supply all additional data to the database manager for addition to the existing information.
- x. Once this has been successfully completed, the process should be applied to the other Regions in Tanzania. This would be different projects in different phases

Human Resources ReCAP Funded:

A service provider should be appointed with specialist knowledge on material mapping techniques, material assessments and the cost-effective application of local materials in the construction of low to high-volume roads. One of the main responsibilities of the service provider is to transfer knowledge and expertise to Tanzanian engineers who will then assume responsibility for the implementation of the materials mapping processes in other Districts as well as in other Regions in Tanzania. Hence, the capacity building and implementation programme will have to involve engineers from the Prime Minister's Office – Regional Administration and Local Government (PMO-RALG), inclusive of District engineers and especially staff from LoGITReC, CML, as well as university students willing to be involved in this study as part of their post-graduate studies.

It will be expected that the service provider will spend 90 days (18 weeks) of productive time in-country (in Dodoma and Dar es Salaam and in the Region prioritised for this study) to provide specialist support and build local capacity, and 10 days (2 weeks) outside the country over a period of 18 months. The time spent outside the country should be devoted to the compilation of reports (i.e. Inception Report, progress reports, workshop reports and Final Report) as well as the preparation of workshop material.

Parallel Resources – non ReCAP Funded:

The project team should consist of at least three researchers (two concentrating on the materials location and sampling side, the other on the GIS and database development aspects) sourced from LoGITReC and CML who would work side by side. The project would require full-time input from a lead researcher but less input from the other researcher and GIS specialist.

It would be essential that the researchers involved in this project liaise closely with other government institutions, such as Soils, Agriculture, Geological Survey and universities in order to gain maximum benefit from the relatively "high tech" and rapidly developing science of remote sensing and satellite observation, amongst others.

For maximum benefits, the lead researcher should be an experienced Materials Engineer or Engineering Geologist (preferably with a Masters but minimum BSc (Hons)), while the other researchers should be a road materials engineer and a GIS expert, the latter qualified at least at Honours level.

In addition, at least two experienced field engineers/technicians would be required together with laboratory and field testing staff/labour. They should be sourced from LoGITReC and CML. The field

engineers/technicians should be experienced in routine field testing (test pitting and profiling), sampling, sample management and other skills required for this project.

Other Resources:

The resources needed initially would be mostly related to GIS and means of analysing and interpreting remote sensing data, particularly multi-spectral satellite or air-borne imagery. This would require purchasing such imagery and the software required for analysis and the resources to analyse relatively large files. Ideally, such skills and other resources should be sourced from within PMO-RALG or TANROADS.

Field testing and sampling equipment would be normal apparatus. A mechanical excavator capable of excavating trenches to a depth of three metres will need to be available for the sampling, and means of transporting large quantities of sample back to PMO-RALG/CML laboratories for testing will be required.

Project Outputs, Impacts and Uptake Strategy:

The deliverables from this project will be medium to long term development of the national road material and aggregate database and inventory. The location of sources of material and the material attributes should be captured in GIS for easy access to anyone who requires the information for a project in a specific area.

A number of benefits will be achieved by having a national road material and aggregate database and inventory.

Firstly, the design of new and rehabilitated roads will be able to make use of the identified materials which can provide the optimum design based on the best local materials available, thus potentially limiting the importation of materials from elsewhere.

Secondly, the time normally required to locate materials at the pre-tender and tender stage will be reduced and more confidence will be held in the materials proposed. There are many instances where the availability of good quality material is limited. Identified materials properties will therefore provide the initial project input based on the best local and nearby available materials for a project. It is envisaged that not only will the database contain information on existing materials sources but also on potential sources and post-construction performance, based on data obtained for similar material, climatic and topographic conditions. Thus a database containing information about the location, properties and volume of road building materials will assist in more effective planning and costing of road maintenance and road construction.

Thirdly, this project will extend the use of information collected on different materials to support the research agenda of LoGITReC. The analysis of the data collected will assist LoGITReC to establish correlations between material properties and performance, as well as to establish material costs for specific construction and maintenance projects.

This project would also assist in developing new material sourcing technologies and methods. LoGITReC would develop experience that can assist when consultants cannot locate suitable materials.

Finally, the GIS system and database would ultimately become integral parts of the Road Asset Management System.

Once the database and inventory development has been completed, countrywide implementation will take place through training to be provided by LoGITReC to all prospective users of the system.

It is proposed that a workshop be organised two months after project initiation of the project to discuss and agree on the mapping principles that will be adopted for the identified Region(s). It is also proposed that a final workshop be held at the completion of the mapping study to share the outputs and outcomes of the project as well as lessons learnt; the latter to benefit the rollout of materials mapping to other Regions.

Other Regions should be introduced to the process and the same procedure can be followed for each of these. It must be noted, however, that other Regions might have totally different geological features, which may require development of the process from first principles each time. The ReCAP service provider appointed for this study should provide some general guidance on these issues to the project team of LoGITReC and CML.

The following AfCAP Logical Framework indicators would apply:

- **Outcome Indicator 1:** Improved engineering practices in road construction
- **Outcome Indicator 4:** Concrete example of change influenced by AfCAP applied to #km of road
- **Output Indicator 1.1:** Practices supporting cost-effective LVRR construction and maintenance
- **Output Indicator 2.1:** % research projects led by African researchers

Key Contacts:

Prime Minister's Office – Regional Administration and Local Government (PMO-RALG):

- Director of the Infrastructure Directorate: Eng Elina Kayanda
- Assistant Director: Planning and Research, and Head of LoGITReC: Dr Fikiri Magafu
- District engineers (information on borrow pits and other sources of road construction material)

Tanzania National Roads Agency (TANROADS):

- TANROADS Regional Managers (information on existing borrow pits and other sources of road construction material)

Central Materials Laboratory (CML) of TANROADS:

- Manager: Eng Mussa Mataka
- Staff involved with current road trials: Eng John Malissa and Salahe Juma

Other organisations in Tanzania:

- Ministry of Works
- Ministry of Energy and Minerals
- Ministry of Natural Resources and Tourism
- Ministry of Agriculture, Food Security and Cooperatives
- Universities

Key References:

<<<Tanzanian key references to be provided by CML>>>

Project AFCAP/MOZ/091: Identification and Mapping of Calcrete Deposits in Inhambane Province and Preparation of a Calcrete Classification System and Specifications for the Use of Calcrete in Road Construction in Mozambique (Final Report, produced in March 2013 by TRL Limited, UK, in association with InfraAfrica (Pty) Ltd, Botswana and Hearn Geoserve Ltd, is available on the ReCAP website: www.afcap.org)

Concept Note Submitted by: B Verhaeghe on behalf of the Local Government Infrastructure and Transportation Research Centre (LoGITReC)

Organisation: Prime Minister's Office – Regional Administration and Local Government (PMO-RALG)

Date: December 2015

Concept Note Reviewed by (PMU)

Date:

Annex B: Draft Agendas for Technical and Steering Committees

DRAFT AGENDA FOR THE INAUGURAL MEETING OF THE TECHNICAL COMMITTEE (TC)

Date: xx February 2016

Time: 09h00

Venue: To be confirmed

1. Welcome and Apologies (10 min)
2. Implementation Plan for the Establishment of LoGITReC (20 min)
3. Role and Responsibilities of the Technical Committee (TC) (60 min)
 - 3.1 Agreement on the Terms of Reference for the TC (15 min)
 - 3.2 Membership of the TC (10 min)
 - 3.3 Appointment of Chairperson for the TC (10 min)
 - 3.4 Frequency of TC Meetings (10 min)
 - 3.5 Relationship between the TC and the Steering Committee (SC) (15 min)
4. Prioritised Research Needs (180 min)
 - 4.1 Overview of Past Research Undertaken in Mozambique (30 min)
 - 4.2 Road Research Priorities Identified in Strategic Research Plan (30 min)
 - 4.3 Ongoing Research Projects and Projects to be Initiated in 2016: (60 min)
 - 4.3.1 National Road Material and Aggregate Inventory Database
 - 4.3.2 Continued Monitoring of Existing Road Trials and Establishment of New Road Trials
 - 4.3.3 Development and Implementation of Design Methods for Low-Volume Roads
 - 4.3.4 Optimisation of Delivery Methods for the Maintenance of Local Government Roads
 - 4.3.5 Use of Local and Alternative Materials in Roads
 - 4.4 Additional Research Needs (30 min)
 - 4.5 Prioritisation of Research Needs (30 min)
5. Way Forward (20 min)
6. Any Other Business (10 min)
7. Date of Next Meeting (5 min)
8. Closure (10 min)

(Total estimated time: 315 min or 5 hours and 15 minutes - conservatively)

DRAFT AGENDA FOR THE INAUGURAL MEETING OF THE STEERING COMMITTEE (SC)

Date: xx February 2015

Time: 09h00

Venue: To be confirmed

1. Welcome and Apologies (10 min)
2. Consolidated Overview of LoGITReC: Strategic Objectives (30 min)
3. Role and Responsibilities of the Steering Committee (SC) (60 min)
 - 3.1 Agreement on the Terms of Reference for the SC (20 min)
 - 3.2 Membership of the SC (10 min)
 - 3.3 Appointment of Chairperson for the SC (10 min)
 - 3.4 Frequency of SC Meetings (10 min)
 - 3.5 Relationship between the SC and the TC (10 min)
4. Research Priorities (100 min)
 - 4.1 Process Followed for Identification of Research Needs (20 min)
 - 4.2 List of Projects to be Initiated in 2016 (30 min)
 - 4.3 Research Priorities: Recommendations of the TC (20 min)
 - 4.4 Research Priorities: Endorsement by the SC (20 min)
 - 4.5 Way Forward with respect to Research Priorities (10 min)
5. Establishment of LoGITReC (115 min)
 - 5.1 Vision, Mission, Goals and Strategic Objectives (30 min)
 - 5.2 Physical Location of LoGITReC (present and future) (20 min)
 - 5.3 Resourcing LoGITReC (20 min)
 - 5.4 Funding of Research (20 min)
 - 5.5 Strategic Relationships and Linkages (10 min)
 - 5.6 Knowledge Transfer (15 min)
6. Way Forward (20 min)
7. Any Other Business (10 min)
8. Date of Next Meeting (5 min)
9. Closure (10 min)

(Total estimated time: 360 min or 6 hours - conservatively)

Annex C: Abstract for Conference Paper

INITIAL RESULTS FROM TRIAL SECTIONS CONSTRUCTED IN TANZANIA

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Abstract

The Government of Tanzania is committed to the improvement of the Rural Roads Network in order to catalyze socio-economic development in rural areas. Tanzania has approximately 108,000 kilometers of rural roads under the direct supervision of the Prime Minister's Office – Regional Administration and Local Government (PMO-RALG), of which 43 percent are in poor condition and 57 percent in a fair to good condition. Research and other studies conducted in the past have shown that, in order to reach the national goals, there is a need to improve rural roads by ensuring their passability throughout the year, as well as to improve their long-term sustainability, especially in view of the scarcity of good quality road construction materials.

Various research projects have been undertaken to identify solutions for improving the passability and sustainability of rural roads through the use of locally available materials and technological innovations. The United Republic of Tanzania with assistance from AFCAP constructed two demonstration sites incorporating best practices as well as new innovations to demonstrate the concepts of Environmentally Optimized Design (EOD) and Spot Improvement (SI) design methodologies with the purpose of advancing new concepts that will enable the national goals for the improvement of rural roads to be achieved. The demonstration sites are located on the Bango to Talawanda road in the Bagamoyo District (about 20.3 km) and on the Lawate to Kibongoto road in the Siha District (about 13 kms).

The roads were designed using the DCP-DN method. Two groups of surfacing options were identified and used throughout the project. The first group comprises bituminous surfacing options, such as Otta seals with sand cover seal, slurry seals, double sand seals, double surface dressings and bituminous penetration macadam. The second group comprises non-bituminous surfacing solutions, such as concrete strips, concrete geocells, hand packed stone, concrete paving blocks, as well as unreinforced and lightly reinforced concrete.

Baseline monitoring data were collected for comparison with data collected in subsequent monitoring periods in order to assess the performance and suitability of the various surfacing option for low-volume rural roads. The following monitoring methods were used: visual inspections; photographic logging; measurements of surface profile, surface rutting, surface roughness and surface texture; DCP testing; traffic counts; and GPS survey.

The initial results have shown substantial improvements to the condition of the road and the provision of access when compared to the situation prior to the construction of the demonstration sections. The improvements have also resulted in the more appropriate use of locally available materials and a reduction in maintenance costs.

The paper will address the construction and performance monitoring of the demonstration sites, as well as provide interim recommendations on the applicability of the surfacing types applied on the two demonstration sites.

Key words: Environmental optimized design, DCP- DN design method, passability and sustainability of rural roads, innovation in technology and performance monitoring