

MOBILISING ENGINEERING RESOURCES FOR THE TANZANIA ROAD SECTOR

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ABSTRACT

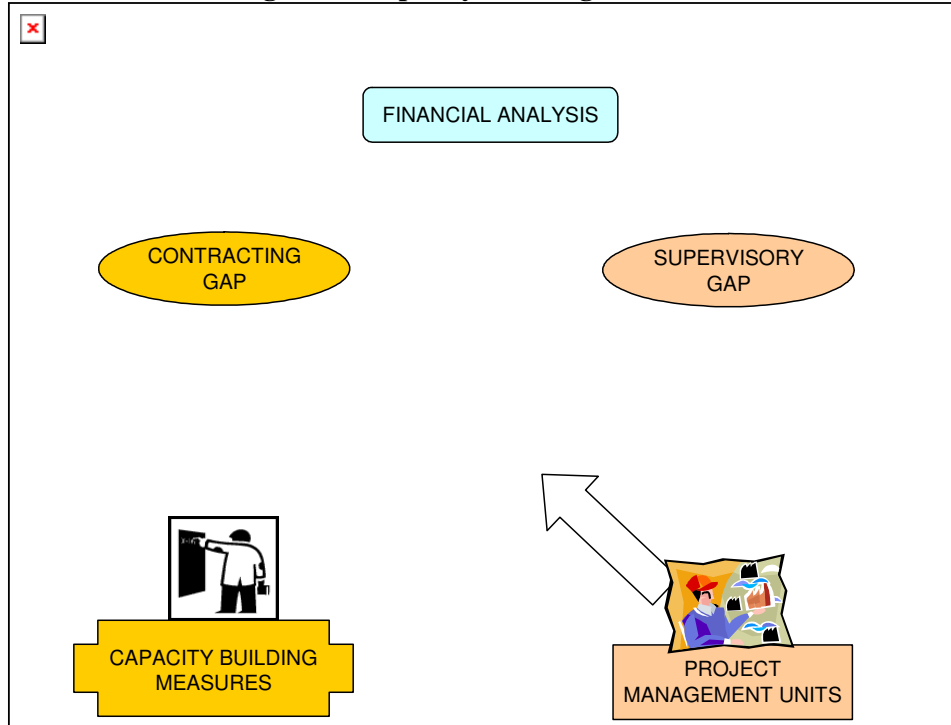
The increase in road fund for 2007/08 amounted to an extra \$100m to the road sector and consequently measures were needed to rapidly absorb these higher levels of finance. A short Strategic Note on increasing absorptive capacity in the road sector was prepared in June 2007 by Adam Andreski of ITT for the Road Fund. It proposed a new financial strategy to eliminate the large backlog in road maintenance in the country and make both routine and periodic maintenance regular activities. It then estimated the shortfall in capacity in the contracting industry to absorb this new money in terms of the gap in supervisory/administrative engineering and contracting resources required to manage this additional workload. The study found that around 114 additional engineers were needed for supervisory purposes and there was a severe shortage of medium scale contractors. Project Management Units were proposed to fill the supervisory gap with the dual functions of managing and supervising the works. This would have the added benefit of capacity building of local contractors and consultants. This paper summarises the findings of that study.

1.0 INTRODUCTION

In early 2007, the Government decided to fully fund the maintenance needs of the road network in the country and increased the Road Fund from Tsh85b for FY06/07 to Tsh218b for FY07/08. This resulted in an urgent need to increase the absorptive capacity of the road industry in terms of both public and private sector to efficiently utilise these funds. The Road Fund commissioned Adam Andreski of I. T. Transport (ITT) to prepare a short Strategic Note that would stimulate discussions on how to increase absorptive capacity in the sector. This paper is a summary of that Note mostly prepared in June 2007.

The Note proposed a new financial strategy to eliminate the large backlog in road maintenance in the country and make both routine and periodic maintenance regular activities. It then estimated the shortfall in capacity in the contracting industry to absorb this new money in terms of the gap in supervisory/administrative engineering and contracting resources required to manage this work. Project Management Units were proposed to fill the supervisory gap with the dual functions of managing and supervising the works. This would have the added benefit of capacity building of local contractors and consultants. This process is illustrated in the following diagram.

Figure 1: Capacity Building Schematic



2.0 FINANCIAL STRATEGY

The increase in road fund for 07/08 amounted to an extra \$100m to the road sector. Year (06/07) expenditure totalled around \$217m in terms of capital, rehabilitation and maintenance expenditure as shown in Table 1 below. An investment strategy was proposed for financial year 07/08 and onwards where greater emphasis was placed on maintenance and rehabilitation. The last column of the table gives the difference between the two years.

Table 1: Road Sector Investment

Expenditure (\$m)	06/07	07/08+	Diff.
Capital	122	107	(15)
Rehabilitation	30	130	100
Maintenance	65	80	15
Total	217	317	100

Based on these new financial levels, an expenditure profile was proposed giving percentages of sums available to be spent on large, medium and small contracts for capital, rehabilitation and maintenance works. Common sense and experience tells us that large contractors will do the bulk of the major projects, medium sized would do a large proportion of the intermediate or rehabilitation/backlog works and small contractors would do the bulk of maintenance. Typical contract values for large, medium and small contracts were inserted in the table. This then enabled an estimate to be made of the contracting profile required in terms of large, medium and small contracts on

capital, rehabilitation and maintenance works. Table 2 shows, for example, that if 80% of the capital budget of \$107m went on large contracts averaging \$2.5m each then 34 capital works contracts would be required to spend this sum. It can be seen that the total number of contracts required is over 2,000 although the bulk of these would be small contracts most likely managed at local level.

Table 2: Implication of Investment Strategy on Contracts Required

Investment	Investment Strategy (07/08)	% spent on contracts		
		\$ millions	Large	Medium
Capital expenditure	107	80	20	0
Rehabilitation expenditure	130	40	40	20
Maintenance expenditure	80	0	40	60
Total	317			
Average Contract value \$m		2.5	0.8	0.04
Nos. of Contracts				
Capital Works Contracts		34	27	-
Rehabilitation Contracts		21	65	650
Maintenance Contracts		-	40	1,200
Total contracts per year		55	132	1,850

3.0 CONTRACTING GAP

If one assumes that large contractors can carry out two contracts simultaneously in a year, medium contractors one in a year, and small contractors can do 2 contracts within a year, then over 1,000 contracts are required as shown in table 3 below:

Table 3: Contractors Needed

	Large	Medium	Small
Total contracts per year	55	132	1,850
Av Contracts per year per contractor	2	1	2
No. of contractors needed	28	132	925

Table 4 below estimated the availability of contractors based on CRB registrations assuming that 70% of the market is in the road sector. For example 56 medium sized contractors are available but the number needed is 132 making a shortfall of 76.

Table 4: Contracting Gap

Register of Civil Contractors Dec 06		Large	Medium	Small
Type/Class		1	2,3,4	5,6,7
Domestic		11	80	1,633
Foreign		20	0	0
Total		31	80	1,633
Roads % of civil works	70%			
Contractors Available		22	56	1,143
No. of contractors needed		28	132	925
Shortfall		6	76	- 218
Availability		79%	43%	124%

The conclusion is that there are enough small contractors. However, they need a regular flow of work (largely routine maintenance and small structure repair) in order to develop their capacity. The largest gap is for medium size contractors to carry out periodic maintenance and minor rehabilitation – the type of work that has been neglected in the past. There is also a moderate shortage of large contractors, but the international market could satisfy this need.

4.0 ENGINEERING (SUPERVISORY) REQUIREMENTS

It is also possible on the basis of this financial strategy to estimate the corresponding number of engineers required to manage and supervise the \$317m worth of works. Assuming that large contracts require 1 full time supervision engineer/consultant, 4 medium sized contracts can be supervised by one engineer and 10 small contracts by one engineer. Table 5 shows that 273 supervisors are required backed up by 90 contract managers (assuming each manager oversees 3 supervisors on average).

Table 5: Supervisory Requirements

Supervisory Requirements	Large	Medium	Small	Total
Total contracts per year	55	132	1,850	
No. supervisors per contract	1	0.25	0.1	
No. of supervisors	55	33	185	273
Agency Managers per supervisor	0.33	0.33	0.33	
Agency Managers Required	18	11	61	90
Total Engineers required	73	44	246	363

This implies that in a year 363 engineers (or possibly senior technicians for the smaller contracts) are required to supervise \$317m worth of works or just over one engineer per \$1m of expenditure. Since expenditure had gone up by \$100m then, pro-rata, about 114 extra engineers would need to be injected into the sector to effectively absorb this increase in funding. It should also be noted that supervisory engineers would need to be supported by inspectors and materials/survey technicians.

5.0 CONTRACTOR CAPACITY BUILDING MEASURES

5.1 The Key Measure

Ultimately, the private sector responds to market demand. The best way to build capacity of contractors is to provide regular work for all the main actors in the industry. This includes work for large, medium and small road contractors and specialists in particular activities such as bridges, culverts or asphalt paving. Consequently, horizontal packaging (dividing work by activity) & vertical packing (dividing road into sections) is crucial. This implies that the client has an important role in developing the industry, whether they are a large institution such as Tanroads or small ones such as district councils. It is in their best long term interest to develop the industry to ensure good competition across a whole range of activities. Otherwise prices will continue to rise at the current very high levels. However, providing a wide

range of contracts requires considerable planning since managing multiple contracts needs more administrative resources than just employing large contractors.

5.2 Other Contractor Capacity Building Measures

There are many other ways of developing the industry, and probably all these measures combined cannot compensate for an irregular, erratic workload. Nevertheless, it is important to maximise development and a range of other tools are available. These include:

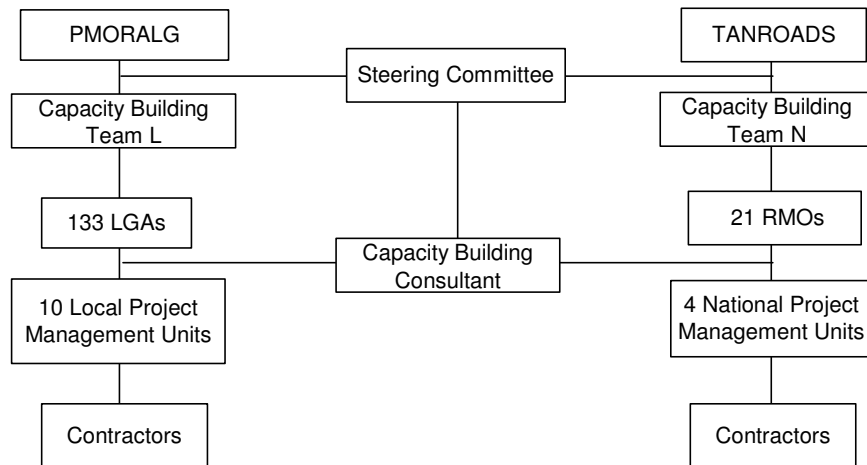
- Long term and/or performance contracts;
- PPRA to issue guidelines on simple contracts, quotations, evaluation procedure & foreign firms working with local;
- Training contracts such as those under TACECA/NCC/CRB programmes; and
- Enhanced credit facilities
- Equipment Hire Units
- Equipment supplied as part of contract with recovery mechanisms

6.0 SUPERVISORY/ADMINISTRATIVE CAPACITY BUILDING MEASURES

Contractors cannot work alone and require on-site supervision and office administration, for example, processing certificates by the client. This is even more important in a developing industry where a large number of inexperienced contractors may be employed. Section 4 above estimated that to absorb \$100m worth of additional road fund money, 114 additional engineers would be required with a similar number of technicians. This quantity of experienced engineers is not available on the market. The engineering profession needs to be built up in terms of numbers and quality. Employing new graduates and throwing them in the deep end is an option where some may very quickly learn to swim. However, others are likely to flounder and make expensive mistakes.

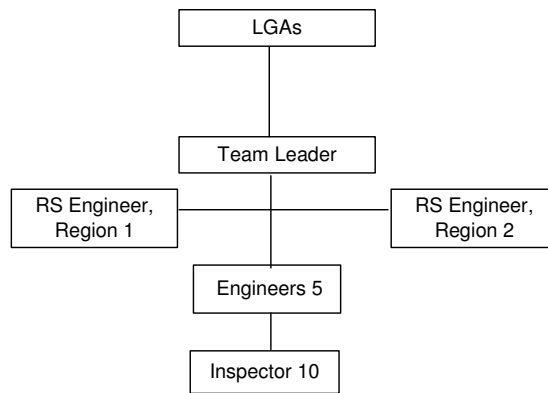
Consequently, structures and mechanisms are required to absorb new engineers in a way that they can learn from more experienced professionals. One such mechanism proposed in the absorptive capacity study would be to assemble Project Management Units (PMUs) to organise both physical works and assist in contractor capacity building measures. These PMUs could be procured and managed by Capacity Building Teams assembled by Tanroads and PMO-RALG. A possible organisation framework is illustrated in figure 2 below.

Figure 2: Proposed Capacity Building Organisational Framework



The main concept was that the PMUs would provide a mechanism for absorbing fresh graduates and hence provide the additional human engineering resources required as estimated. Figure 3 below proposes that local roads be supported by PMUs in 10 zones (2 regions). These PMUs would be contracted by the LGAs to procure, manage and supervise works on their behalf.

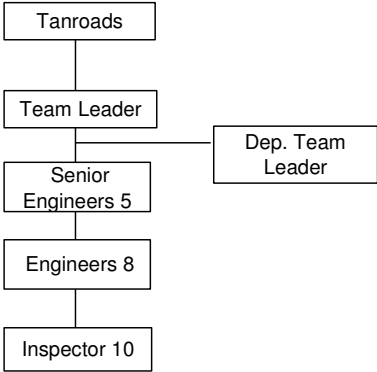
Figure 3: Proposed Local PMU Organisation Chart – 10 Zones



Each district would second an experienced inspector to the unit. A graduate or junior engineer, newly employed by the consultant, would support two of these inspectors. The RS Engineers would also be attached to the unit and provide useful experience and the Team would be lead by an experienced consultant. The junior staff would learn from the experienced Team Leader and the inspectors. The inspectors would also learn up to date techniques from the engineers. This process would inject 50 of the 114 engineers needed. Once the PMU finishes its mandate, in say 3 to 4 years, the inspectors would revert back to their districts. By this time the new graduate engineers will have gained sufficient experience to become registered with the Engineers Registration Board.

Currently PMO-RALG is implementing a version of this proposal and is in the process of procuring 5 zonal consultants to assist the LGAs on a call down basis. A similar scheme was proposed for Tanroads as illustrated in the following diagram (fig 4) but this has yet to be taken up. This would have injected the remaining 60 or so engineers needed.

Figure 4: Proposed National PMU Organisation Chart – 4 Zones



7.0 CONCLUSIONS

Even with increased levels of funding, there are enough small contractors registered in the country to carry out basic routine maintenance on the national and sub national road network. The main constraint is setting the administrative and supervisory structures to procure and supervise the works contracts. The main gap in the construction industry is in the medium sized contractor who would generally carry out periodic maintenance work. This has largely been due to the fact that severe budget constraints have meant that the demand for periodic maintenance has been low and hence there was no market for the medium sized contractor. Now that funding levels have improved this will change with time, but there is a case for putting in specific measures to encourage these types of contractors to emerge.

This paper identified that more engineers are required to manage the increased workload. Unfortunately, ERB report that the number of engineers joining the industry is decreasing and that output of graduates from universities is declining. This decline is largely due to the fact that the demand for their services is not there. This is ironical in the light that overall demand for construction is increasing. Strategies are required to provide a demand for fresh graduates and this paper proposes one such strategy.

REFERENCES

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