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Analysis of Participation of Labour Based Road Contractors in Rural Road Works in Tanzania

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Abstract: ***Labour based method is a construction technology that prioritizes the use of labour rather than equipment. The method can contribute to poverty alleviation through creating job opportunities for local communities in rural areas and at the same time optimizing the use of local resources. As such, Labour based method (LBM) is considered as one of the most significant and effective methods in infrastructure development in developing countries. This study intended to assess the participation of labour based road contractors in rural road works in Tanzania. The objective of the study is focused assessment of participation of labour based road contractors (LBC) in rural road works in Tanzania, specifically with focus on assessing the extent of participation of LBC and identifying the challenges facing Labour Based Contractors. The study employed the use of structured questionnaires which involved labour based road contractors, labour base clients and labour based stakeholders. The findings reveals that the participation of LBC in rural road works in Tanzania is low in terms of number of LB projects advertised, number of district participating LBC, LB works awarded to LBC and road maintenance activities used labour based methods.***

Keywords: Labour Based Method, Labour Based Road Contractors, Rural Road Works, Tanzania.

1. Introduction

Poverty and underdevelopment are closely correlated to lack of functional infrastructure and underemployment [1,]; [2]; [3]. Infrastructure, including social and economic infrastructure helps to build the conditions for economic growth and poverty reduction. The use of Labour Based Approaches (LBA) to build and maintain infrastructures is currently recognized as a strategy to promote pro-poor growth through job creation, creation of useful infrastructure and transfer income to poor. Labour Based Approaches produce other effects which include income multipliers generated by spending of wages, impacts on local labour markets, micro-enterprise development, capacity building, and enhanced employability of workers after the programmes are completed (OECD, 2005). Labour based Technology (LBT) means the application of labour/equipment mix that gives priority to labour, but supplemented with light equipment where necessary for reasons related to quality or cost. Besides, LBT aims to promote a more rational use of locally available resources in the construction of our infrastructure [4].

In Tanzania, tremendous effort has been applied to train LBT Contractors and Consultants. The list of available labour based contractors is impressive and could make a great impact on the construction scene, if it will be properly utilized [5]. At present, there are 143 labour based road contractors (LBC) registered by Contractors Registration Board (CRB). The registration shows only 1 (one) LBC registered under class I, 3 (three) LBC registered under class II and 139 (one hundred and thirty nine) LBC registered under class III [6].

According to available policies relating to LBT, at least 20% of road maintenance activities in District shall be for Labour - based methods [7]. Such policies include, LBT supporting poverty eradication [8] and employment creation and adoption of Labour based work on rural travel and transport [9]. However, experience shows that there is no commitment and full support especially on financial basis after the end of pilot projects from local authorities. Also, the issue of fragmented donor driven in isolation has imparted lack of local feeling of project ownership and non-joint efforts towards solving issues related to access to appropriate equipment, training and credit [10].

According to Mfinanga [11], the main problem facing small-scale LB contractors is actually the approach in which contracts are awarded, monitored and paid. In this regard, existing contract award procedures do not favour small firms and, specifications can be rigid and contract package may be too large for small firms in terms of size, time limits and the amounts of bonds and guarantee money required. According to the Ministry of Works in Tanzania [4], the road sector is considered as a major contributor in facilitating socio-economic development of the poor rural areas. This sector is noted to contribute towards 5% of the overall GDP and handles 70% of internal freight traffic and 60% of transit cargo [12]. Existing data shows that Tanzania's road network comprises 89,940.47 km as of December, 2013 which is distributed as follows: 12,203.73 km of trunk roads, 22,129.65 km of Regional roads and 55,607.09 km of Local roads [13].The local roads are managed by the 164 Local Government authorities of Tanzania Mainland (city, Municipality, Town and District Councils) acting as roads authorities. These councils carry out planning, prioritization, project design, tendering and supervision of maintenance and development works implemented by contractors as well as supporting the villages' communities in maintaining and improving the community roads.

Development and maintenance of the rural roads and transport infrastructure was previously assumed being gender neutral while at present, various studies have revealed that men and women have varying transport needs and constraints that are affected differently by rural transport interventions. Women in rural areas, who balance the productive, social, and reproductive roles in their local societies, are highly in need of a gender responsive rural transport infrastructure that can enhance their income generation and participation in decision making activities. It is through this spirit that rural roads are extensively championed by different stakeholders as instrument for alleviating poverty. The aim is to raise living standards among the poorest population in rural areas by engaging them in the rehabilitation of existing feeder, district and regional roads through labour promoting methods and technology [12].

2. Labour Based Technology - Concept and Applied Terminologies

2.1 Conceptual meaning

Labour based is a term used to describe a technology in which labour supported by light equipment, and is used as a cost-effective method of constructing and maintaining infrastructure of a required standard. According to [14], this definition has three components:

1) Labour, and very often local labour, is the used whenever feasible
2) The construction and maintenance should be cost-Effective
3) The infrastructure should be of the required standard and not of poor quality.

2.2 Road

Road means an identifiable route, way or path between two or more places and includes any road, highway, street, bridge, culvert, wharf, car park, footpath or bridge path on which vehicles are capable of traveling and to which, the public has access whether or not such access is restricted and whether subject to any condition, but does not include any road within the cartilage of any dwelling [15].

2.3 Road Maintenance

Road maintenance means all works to preserve riding quality, road shape, drain, culverts, structures and bridges, spot improvement of bad spots to maintain accessibility; resealing, reshaping and regravelling [16].

2.4 Road Rehabilitation

This includes activities that restore the original condition of the road through relatively extensive works like pavement layer reconstruction, mill and replace, reshaping of the cross-section, reconstruction of the shoulders, drainage works and thick overlays [16].

2.5 Local Resources Based Approach (LRBA)

Local resources include: (i) human resource including local government, private sector, NGO and community institutions, local entrepreneurs such as contractors, consultants, industrialists and artisans. (ii) local skills (iii) locally made or intermediate equipment. (iv) local materials such as timber bricks and marginal materials and (v) locally raised finance or provision of materials or services in kind [17].

2.6 Local Resources Based Approach (LBES) Technologies

Labour Based Equipment Supported (LBES) are technologies whereby labour is supported by equipment to deliver a technically defined range of infrastructure works to a specified standard. On other hand, Labour-intensive (LI) technology is defined as technologies that use only labour supported by hand tools [18].

2.7 Capital - based technology (CBT)

Capital-based technology in road works is defined as the utilization of automated systems, machines and computer platforms to impact the improvement of efficiency in production and service delivery. The exact inspirations for utilizing computerization are increased profitability and/or quality. The right use of CBT generates about 3 to 4 times the output of Labour-based technology with no increment in labour costs. The day by day life of society has turned out to be more dependent on automated systems to the extent that life does not appear to be significant without these automations [19].

2.8 Labour content in the total cost of a project

The typical labour content in the total cost of a project is only indicative, varying with wage rates and the cost of other essential inputs. In this context ‘’Employment intensive” is a broader term to describe a variety of strategies or programmes to promote employment. Different possibilities and levels of substitution between labour and equipment are summarized in Table 2.1. On the other hand, Labour Intensive (LI) focuses on maximizing employment of labour force and allows the use of only hand tools or very limited light equipment. Labour-based equipment supported (LBES) or Labour-based appropriate technology (LBAT) concerns with the use of small-scale appropriate equipment to achieve competitive productivity, cost and quality. Small-scale equipment usually includes plate compactors and pedestrian vibrating rollers but not bulldozers. Labour based (LB is more generic and is described as ‘a technology that applies a labour/equipment mix that gives priority to labour [20].

Table 1: Classification of Construction Technologies

Technology	Abbreviation	Typical Project Labor Content
Equipment-based (conventional)	EB	5% <15%
Modified-equipment- based	MEB	<30%
Labor-based equipment-supported Labor-based appropriate technology	LBES LBAT	<40%
Labor-intensive	LI	<80%

(Source: [21])

2.9 The Need for Labour Based Technology

The diverse economic, resource, industrial, service sector and social circumstances of many economically emerging and developing countries (EDC) suggest that the technologies and methods used for road construction, maintenance and rehabilitation should also differ and be appropriate for their individual local circumstances. What is actually required is an appropriate technology and management approach [22].

Emerging and developing countries are often characterized by a resource base that is very different from that found in the developed countries. For example, they may have abundant low cost labour, local traditions and procedures and a fledgling or intermediate technology industrial and service base. It makes economic and management sense to seek an optimal use of these lower cost, locally available resources before importing expensive equipments, materials and expertise on large scale. Also, there are particular additional factors in Tanzania such as the dispersed rural population and low density of the existing road networks, particularly problematic and expensive in these communities [22].

2.10 Objectives of LBT projects

The objectives of LBT projects are basically classified into four specific areas, which are: (i) infrastructure development (such as public access improvements); (ii) economic development (helping to lower costs, reduce poverty and activate the local economy); (iii) technology transfer (training engineers for national and local governments and in small and medium-sized enterprises (SMEs) and (iv) community development (improving governance skills and encouraging community ownership). The following examples of outcomes related to these objectives are provided in Table 2. It is important to note that technology transfer and community objectives are characteristic effects of only LBT.

Table 2: Examples of LBT Effects (Source: [23]; [24])

Objectives	*Examples of effects*
Infrastructure development	Enables smooth traffic. Improves access to markets
Economic development	Effects on the local economy. Increased business in roadside shops after completion of road construction. Stable supply of agricultural products and improvements in wholesale purchase prices
Technology transfer	Improved supervisory and construction capacity of central and local governments and small-scale contractors Acquisition of construction technology and skills by local people participating in the works
Community development	Creates jobs Supports women's social participation Promotes settlement along roads and streets Upgrades the community with ownership and maintenance skills related to road management. Formation of cooperation awareness, recovery of confidence and consensus building.

2.11 Application of LBT/ EBT works

Labour Based Technology (LBT) or Equipment Based Technology (EBT) works can be applied for infrastructure development. In selecting LBT or EBT, an understanding of the characteristics of LBT or EBT works is important. Table 3 describes the fundamental characteristics of LBT and EBT which must be considered during decision making process.

Table 3: LBT and EBT Characteristics
(Source: [1]; [23]; [25])

Characteristics	LBT	EBT
Technical potential	1) Small-scale works, such as feeder roads in farming villages, and living environment improvements in urban slams. 2) Abundant labour required 3) Work schedule not strictly required to be completed within a designed period. 4) Work do not necessarily require a high quality standard	1) Useful with difficult project sites, requiring high technology such as stabilizing soft ground areas and large- scale public works. 2) Used when it is difficult to procure labour or when labour cost is high 3) Work schedule needs to be completed within a designed period (ensuring efficiency) 4) Work needs to be of high-quality (ensuring quality)
Social effects	Projects aiming for socioeconomic development through the construction, maintenance and repair of facilities (activating community through poverty reduction, job creation, training local contractors and generating cash income)	Projects aiming for socio-economic effects(benefits) from provided facilities or roads
Financial feasibility	Useful when project budget is limited and application of EBT is difficult (maximized use of labour).	Used when the project budget is sufficient for EBT (efficiency with machine application).

2.12 Formulating the LBT implementation system

LBT implementation systems descend into three categories, which include a total number of seven methods. These methods are shown in the Table 4.

Table 4: LBT Implementation system Categories (Source: [26]; [27])

Major category	Sub - category	Method
Force account/Direct labour		A public agency carries out all construction works in-house, directly supervising and managing its light equipment and labour.
Contracting	Conventional	An employer makes a unit rate contract directly with a large-scale contractor to contractor to carry out works using LBT.
	Subcontract	An employer signs a contract with a relatively big contractor to carry out works and the contractor, then subcontracts the labour based portion of the works to smaller firms.
	Government - Run	An employer, mainly a government road agency, makes a direct contract with small-scale contractors to carry out works, but retains the responsibility of the employer for supervision of the works.
	Agency	An employer hires an "agency'' to manage small contracts and train small-scale contractors. The agency then makes contracts directly with small-scale contractors to carry out works.
	Development team	An employer assigns different functional responsibilities to different actors: the work is contracted out to small-scale contractor, while procurement management is contracted out on a fee basis to a material manager and construction management is contracted out on a fee basis to a construction manager.
Community Contract		A community contract is an agreement between a community and a contracting authority, whereby the community (or a section of the community) is responsible for implementation of the works and therefore functions as the contractor.

2.13 Benefits of using Labour Based Methods

Policy Guidelines for the 1996/97 National Labor Based Road Sector Programme recognize direct and indirect benefits of using labour based methods. These benefits are numerated as follows: (i) Creation of jobs in rural areas where other wage earning and idle labour opportunities are few (ii) Reduced required for foreign exchange, as more of the costs are local costs (iii) Reduced dependency on heavy equipment that is always difficult to maintain, particularly working in areas remote from main suppliers, manufacturing agents and workshops (iv) Boost to local economy through spending power of worker's wages (v) Provision of work opportunities to women as the recruitment of road workers is always organized close to worker's homes, a situation necessary for most women (vi) The acquisition of skills by workers employed on road construction and maintenance (vii) Encouragement of a sense of ownership of rural people through their involvement in the construction and maintenance (viii) Reducing migration to urban areas, mainly through large scale national programmes that offer a steady number of work opportunities in rural areas, and (ix) Assisting with poverty alleviation to the extent that the labourers who seek work on the road works are always poorer people who have minimal options, for example, those who have little or no land to cultivate [12] .

2.14 Advantages of Labour Based Methods

Labour-based methods in road development projects are expected to create benefits in the following areas: social and community development, economic advantage and private sector development.

Labour based methods contribute to social and community development through provision of job opportunity creation and income, promotion of gender mainstreaming by providing job opportunities to women, and enhancement of community ownership of local road infrastructure through directly participation in road works. Second, Labour based methods could have a cost advantage compared to conventional Equipment Based (EB) methods. Third, these methods promote private sector development, especially, small-scale contractors. Fourth, the past cost breakdown studies indicated that LB methods are cheaper than conventional EB methods by 10–50% as for economic aspects [20]. Actually up to 60% of costs can be retained by the community. Fifth, Labour based methods can generate considerable job opportunities to communities and the amount of job creation varied according to works or road conditions on a site. Sixth, they also promote private sector development through contracting out with small-scale LB contractors. Seventh, as a social aspect, LB methods could contribute to poverty alleviation through income generation and job creation. Eighth, these methods could enhance a sense of ownership and skills transfer by participation of local people in road works. But this will depend on whether a road is used by one community or several communities. Ninth, Labour based methods can promote valuable opportunities for the employment of women.

2.15 Disadvantages of Labour Based Methods

Although Labour Based Methods have many advantages, however, it is faced with quality issues on maintenance and rehabilitation works, especially on non-maintainable roads. Such works could be improved by appropriate equipment use according to the type of works. Appropriateness of labour based methods over Equipment based methods also depends on availability of labour, equipment, materials, and types of road works and road conditions in a site. Second, Work period required for LB methods could be longer than EB methods because of hand works. Third, half of the delays did not account for the technology choice but other reasons such as low availability of equipment and labor, and labour management problems. Fourth, some contractors still prefer Equipment Based Methods because contractors expect substantial labour management of many workers and a risk of late payment from Executing Agents (EAs). Fifth, sustainability of LB contractor industry is still a demanding issue. Sixth, LB methods have capacities of both EAs and contractors are weak. Lastly, LB methods could increase

management works if Executing Agents directly contract with many small.

2.16 Conceptual framework

To accomplish this research on assessing involvement of labour based road contractors in district councils in Morogoro and Coastal regions, a simple analytical framework has been developed (Figure 2.1). It is based on the assessment on how government can influence achievement of LBT in district councils through participating LBC. The participation of LBC in rural road works can be achieved through coordination of various stakeholders as the figure illustrates.

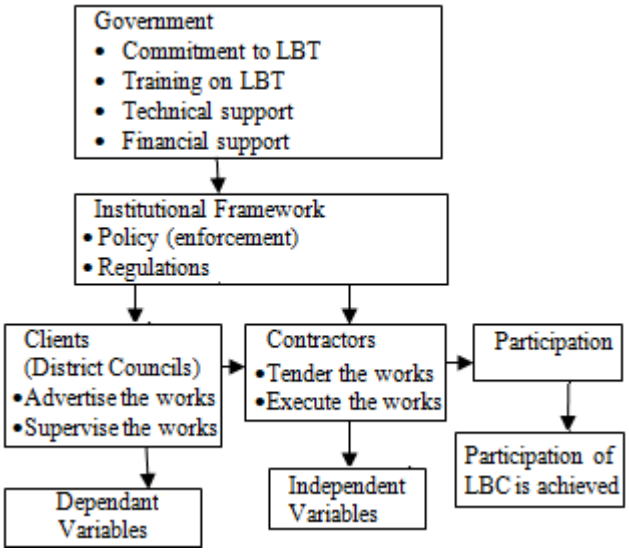

Figure 2.1: Conceptual Framework for Assessing Participation of LBC

3. Methodology

The present research was conducted using literature review, interviews and questionnaires to collect data. The aim of this study was to assess participation of Labour Based Road Contractors (LBC) in rural road works in Tanzania, therefore, a relatively number of questionnaires were issued to LBC compared to other respondents. The other respondents included the District Council (LB client and consultant), Contractor Registration Board (CRB), National Construction Council (NCC), Ministry of Works, Transport and Communication (MWTC), Public Procurement Regulatory Authority (PPRA) and community.

The questionnaires consisted of both open and closed ended questions that were reasonably related to research topic. The content, response of the structure, wording of the questions sequence were different from respondents. A total of seventy six (76) questionnaires were distributed and only 66 qualified for data analysis. In addition, eight (8) interviews were conducted engaging public and private entities.

Table 5: Distribution and response rate of distributed Questionnaires

Respondents from	Number of Questionnaires		
	Distributed	Returned	Percentage of Success (%)
LB Contractors	59	50	85
LB Clients	7	7	100
Other LB stakeholders	10	9	90
Total	76	66	87

(Source; Field Data, 2017)

The majority of respondents had earlier trained on LBM and had experience in the LBM more than 11 years; and at least 70% with more than six years of experience. This implies data was collected from experienced persons in LBT, therefore a justification for reliable data.

Table 6: Rural Road Projects for 6 years **(**2010/2011 - 2015/2016) (Source: Field data, 2017)

District Council	Total contract sum in Tanzania Shilling (TZS)			Total number of projects				
	All road works (millions)	Awarded to EBC (millions)	Awarded to LBC (millions)	EBC& LBC	EBC	LBC	Advertised (LBC)	% of LBC
Kibaha	2,265.43	2,265.43	-	40	40	0	0	0
Kilosa	1,783.42	1,783.42	-	13	13	0	0	0
Kisarawe	2,885.19	2,885.19	-	39	39	0	0	0
Mkuranga	1,499.53	1,499,53	-	88	88	0	0	0
Morogoro D.C	3,478.77	3,478.77	-	47	47	0	0	0
Mvomero	4,827.97	4,827.97	-	37	37	0	0	0
Rufiji	3,608.41	3,472.08 (96%)	136.33 (4%)	65	59 (91%)	6 (9%)	6	9
Number of District council				7	7 (100%)	1 (14%)	1 (14%)	14

4. Data Analysis, Results and Discussion

4.1 Data Analysis

Data collected was analyzed using percentage score (PS) to generate rating of the variables of interest as determined by the following formula:

PS = N/Sx100%; where:
N = Number of LB projects, Total amount of LB projects, LB works advertised
S = Total number of gravel and earth (unsealed) road projects, total amount of unsealed road projects and total number of unsealed works advertised.

4.2 Results and discussion

A question based on number of advertised and awarded rural road projects to LBC and EBC, and size or amount of total value of rural road works for LBC and EBC for a period of 6 years were asked to an LB client. LB clients' respondents

were asked to indicate number of works advertised and awarded as LB works and EB works and their total value for a period of 6 years. Table 6 shows that 7 (100%) of respondents are advertising and awarding EB works, 1 (14%) of respondents are advertising and awarding LB works, Also, the LB client (district council) who participate LBC in rural road works, the percentage of road funds for LBC is 4% while for EBC is 96% and the percentage in terms of number of projects for LBC is 9% while for EBC is 91% of all projects for a period of 6 years.

Number of rural road project(s) awarded in each year from 2010/2011 to 2015/2016 was asked to LBC. Table 7 shows the average that, 23.67 (47.4%) of LBC's respondents didn't awarded the projects. Followed by 18.5 (37.0%) of the LBC's respondents were awarded less than 2 projects, 2.17 (4.4%) were awarded projects between 2 and 5projects and 5.67 (11.2%) of the LBC's respondents were not yet registered as a labour based road contractors (LBC)**.** This means that few Labour base road projects in rural road works were awarded to LBC.

Table 7: Number of Projects awarded to LBC per year **(**2010/2011 - 2015/2016) (Source: Field data, 2017)

Year	Number of respondents				
	No. of projects	Less than 2	2 to 5 projects	Not registered	Total
2011	21 (42%)	17 (34%)	3 (6%)	9 (18%)	50 (100%)
2012	21 (42%)	18 (36%)	2 (4%)	9 (18%)	50 (100%)
2013	24 (48%)	18 (36%)	2 (4%)	6 (12%)	50 (100%)
2014	26 (52%)	15 (30%)	3 (6%)	6 (12%)	50 (100%)
2015	26 (52%)	20 (40%)	0 (0%)	4 (8%)	50 (100%)
2016	24 (48%)	23 (46%)	3 (6%)	0 (0%)	50 (100%)
Average	23.7 (47.4%)	18.5 (37.0%)	2.2 (4.4%)	5.6 (11.2%)	50 (100%)

(Source: Field Data, 2017)

The reasons for LBC not participating in rural road works were questioned to LBC. LBCs respondents were asked to vote for the reason and cause of non-participation of LBC in rural road works in Tanzania. From Table 8 it shows that, Clients are unaware of Labour Based Contractors potentials scored 41votes of LBC respondents, Consultants are unaware of Labour based Contractors potentials scored 35 votes of LBC respondents, lack of financing mechanism for LBT scored 26 votes of LBC respondents, difficult to manage unskilled labour in Labour based Technology scored 8 of LBC respondents, Labour based contractors (LBC) are not getting works scored 41votes of LBC respondents, LBC do not have enough capital to execute large works scored 38 votes of LBC respondents, LBC do not have essential equipments (for example pedestrian roller, tractor / tipper and water bowser) scored 32 votes of LBC respondents, Available projects are awarded without giving consideration to LBC scored 47 votes of LBC respondents, the negative attitude to LBT use scored 42 votes of LBC respondents , the lack of technical and managerial skills of engineers and technicians in the use and choice of appropriate technology (LBT) scored 26 votes of LBC respondents.

Other reasons were reluctance by engineers at District and National levels in accepting Labour Based Method (LBM) instead of Equipment Based Methods (EBM) scored 35 votes of LBC respondents, Lack of government commitment to LBT scored 44 votes of LBC respondents, unconvinced policy makers on level of delivery of LBT scored 42 votes of LBC respondents, Lack of appropriate legislation and regulations to deal with LBT scored 36 votes of LBC respondents, Lack of clear policy statements on local construction industry development and sustained involvement of local private sector scored 42 votes of LBC respondents, Lack of documented evidence of LBT achievement scored 20 votes of the LBC respondents and Lack of government capacity to deal with contracting involving LBT scored 24 votes of LBC respondents.

Table 8: Challenges Revealed by LBC for Participation of LBC in Rural Road Works

Challenges	Score	Percentage (%)	Ranking
Clients are unaware of Labour based Contractors potentials	41	82	4
Consultants are unaware of Labour based Contractors potentials	35	70	7
Lack of financing mechanism for LBT	26	52	9
Difficult to manage unskilled labour in Labour based Technology	8	16	12
Labour based contractors (LBC) are not getting works.	41	82%	4
LBC do not have enough capital to execute large works.	38	76%	5
LBC don't have essential equipments (for example pedestrian roller, tractor / tipper and water bowser)	32	64	8
Available projects are awarded without giving consideration to LBC	47	94	1
The negative attitude to LBT use	42	84	3
The lack of technical and managerial skills of engineers and technicians in the use and choice of appropriate technology (LBT)	26	52	9
Resistance by engineers at District and National levels in accepting Labour Based Method(LBM) instead of Equipment Based Methods(EBM)	35	70	7
Lack of government commitment to LBT	44	88	2
Unconvinced policy makers on level of delivery of LBT	42	84	3

Respondents rated challenges involved in participation of LBC in rural roads works in Tanzania as shown in Table 8. The responses were ranked using percentage score, while 100% and 0% being the highest and lowest rating respectively.

As indicated in Table 8, the first and top ranked challenge is that, available projects are awarded without giving consideration to LBC, and the second top ranked challenges is the lack of government commitment to LBT. This is a feature identified a result of available projects are awarded without giving consideration to LBC [5];; and also a feature identified a result of lack of government commitment to LBT which is expressed in clear policy statement such as PRSPs [28];. Hence, the finding from the study and those from previous work implicate that the negative attitude to LBT

and unconvinced policy makers on level of delivery of LBT as a serious concern of participation of LBC in rural road works in Tanzania. The issue of negative altitude to its use, despite the proven viability and clear advantages technically, economically and socially for development is a challenge that should also be carefully targeted. Always police makers and the community can be convinced and realize the importance of the approach though the decision makers can act contrary to the idea [10]. The last question that was asked to LBC respondents was to provide suggestion for improving participation of LBC in rural road works in Tanzania. The LBCs respondents were required to vote the suggestion for improving participation of LBC in rural road works in Tanzania. Table 9 shows the suggestions of LBC respondents for improving LBC in rural road works.

Table 9: Suggestion from LBC for improvement of participation of LBC in rural road works

S/N	Suggestion for improving participation of LBC in rural road works	Vote	Percentage (%)	Ranking
1	There are should be deliberate efforts to promote use of LBT in road works from the design stage	47	94	2
2	Employers should encourage joint ventures (JV) of trained Labour Based Contractors (LBC) with non trained contractors during tendering process for LBT works.	41	82	5
3	The employers should create awareness and develop a sub contracting model whereby a large contractor sub-contracts the portions of the projects that are labour intensive to LBC.	35	70	6
4	Memorandum of understanding (MoU) between all the stakeholders should be developed and signed which have a common objective to sustain and promote the use of LBT	42	84	5
5	A national Guiding Policy should be formulated to enable LBT to become accepted.	45	90	3
6	Appropriate Technology Training Institute(ATTI-Mbeya) in collaboration with CRB, NCC should increase systematic training in LBT for contractors, consultant, District Engineers and Technicians	47	94	2
7	Employer or the Government should make arrangements for LBC to access loans from banks for buying equipment	45	90	3
8	Government and Donor Agencies should cooperate to ensure sustainability of LBT;	50	100	1
9	The Appropriate Training Unit(ATU) within MWTC sufficiently strengthened to give technical support to implementing institutions	35	70	6
10	To ensure that appropriate tools and equipment for LBT are available	44	88	4
11	Encourages donors to invest in LB roads rehabilitation as a means to poverty reduction approach	50	100	1
12	Since LBC are not getting jobs therefore Ministry of Works, Transport and Communication (MWTC) and PMORALG should come up with a good policy which will enforce the use of LBT	50	100	1

(Source: Field Data, 2017)

LBC Respondents rated suggestions for improving participation of LBC in rural roads works in Tanzania as shown in Table 9. The responses were ranked using percentage score, with 100% and 0% being the highest and lowest rating respectively. Table 9 shows the three top ranked suggestions for improving participation of LBC in rural road works in Tanzania as follows: MWTC and PORALG should come up with a good policy which will enforce the use of LBT as well as Government and Donor Agencies should cooperate to ensure sustainability of LBT [29]. The other suggestion is to Encourages donors to invest in LB roads rehabilitation as a means to poverty reduction approach [30];.

5. Conclusion

This study has assessed the extent of participation of labour based road contractors (LBC) in rural road works in Tanzania. And further, the study identified the challenges facing participation of LBC in rural road works in the country. The conclusion drawn from the study is presented in section 5.1 and 5.2 respectively.

5.1 Participation of LBC in rural road works in Tanzania

The study findings indicate that the participation of LBC in rural road works in terms of number of district councils using LBM in rural road works is minimal. Number of works advertises as Labour based road works is few compared with the equipment based methods. Number of works awarded to LBC is little as compared to works awarded as Equipment Based works. Funds used for road maintenance activities for LBM is very low compared to EBM as stated in operational guidelines for District Road Maintenance (URT, 2014b), which clearly states that at least 20% of road maintenance activities should be for LBM.

5.2 Challenges encountered in participation of LBC in rural road works in Tanzania

Most respondents commented that, available projects are awarded without giving consideration to LBC; lack of government commitment to LBT; lack of clear policy statements on local construction industry development and sustained involvement of local private sector; unconvinced policy makers on level of delivery of LBT; and the negative attitude to LBT use are the critical challenges. Other challenges revealed that Labour based contractors (LBC) are not getting works; clients are unaware of Labour based Contractors potentials; LBC do not have enough capital to execute large works and very few LB works are advertised.

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References

[1] ILO, International Labour Organization (2010) *Local Resource Based Approaches for Infrastructure Investment: Source Book*. ILO Sub Regional Office for Southern Africa, Harare, Zimbabwe.
[2] OECD (2005), Promoting Pro-Poor Growth: Infrastructure. OECD, Paris.
[3] The International Bank for Reconstruction and Development/World Bank (1994) *World Development Report 1994: Infrastructure for Development*. Oxford University Press.
[4] Ministry of Works ((2003b), Taking the Use of Labour Based Technology to Scale (Establishment of the national Framework) – The programme Document, Dar es Salaam, Tanzania, Ministry of Works.
[5] Mufundi, S. K. (2009), *Tanzania experience on LBT;*Past *past, present and the future prospective*. Paper presented in Roll Out seminar for Labour based Technology, Dar es Salaam, March 2009.
[6] CRB. List of specialist civil works. www.crb.go.tzfile>downloadspecialistcivil-2016.pdf. Accessed March, 2017
[7] URT, (2014b). Operational Guidelines for District Roads Maintenance; Prime Minister's Office Regional Administration and Local Government (PMO-RALG), Ministry of Works (MoW) and Japan International Cooperation Agency (JICA).
[8] United Republic of Tanzania (URT), (2003). Construction Industry Policy (CIP).
[9] NTP. (2011). Ministry of Transport, National Transport Policy, Revised Draft, Tanzania.
[10] Kyombo, L.M. and Msengesi, U. L. (2011). Labour Based Technology in Road construction and maintenance- Experience, Opportunities and Challenges in Tanzania.
[11] Mfinanga, A.D. ((2009). Labour Based Technology; *Its Background, Challenges and Opportunities in Tanzania*, paper presented in roll out seminar for Labour based Technology, Dar es Salaam..
[12] Mhina, E.H. and Kundi, R. (2004), Priority Sector PRS Review from a Gender Perspective: Ministry of Works.
[13] URT, (2014a). Basic Statistics and Information in Construction Industry Sector (2013).
[14] ILO, International Labour Organization (1997). *Sustainable labour-based infrastructure*. Workshop on the implementation arrangements and concepts on programmes for poverty eradication in Kenya,17th-25th November 1997.
[15] URT, (2009). The Roads Management Regulations.
[16] URT, (2006b). The Road and Fuels Tolls Act. Chapter 220, Revised edition, 2006.
[17] Marmo, F.T. (2003). *The local resources based approach to road works.* proceeding of the 10th regional seminar for labour based practitioners, October 2003, Arusha, Tanania.
[18] Song, M. and Philip, K. Song, M. (2010) Mitigating a Jobs Crisis: Innovations Jobs Crisis: Innovations in Public Employment Programmes (IPEP)', ILO EIIP.
[19] Medida, S. (2008). Pocket guide on industrial automation for Engineers and Technicians. First Edition, Volume 6, pp.7
[20] Ogita, S. (2010), Final report for Evaluation of Labor-Based Road Work Methods, Internship Project Report, Harvard Kennedy School, Asian Development Bank.
[21] ILO, International Labour Organization (2005). Guidelines for optimizing local employment in infrastructure reconstruction and development programmes in Iraq.
[22] ATU-Appropriate Training Unit, (1997), *Labour based Manual*, Vol.II, Dar es Salaam, Intech Associates.
[23] Johannessen, B. (2008). Building Rual Roads. ILO Manual.
[24] Tembo, S. and Blokhuis, F. (2004), Manual for Supervision of Labour Based Rehabilitation Works, ILO.
[25] ILO (Labour Bsed Technology) Guidelines. (2012). JICA, Economic Infrastructure Development, Japan International Cooperation gency.
[26] Stock, E.A. and Veen, de J. (1996), Expanding Labour-based methods for road works in Africa, SSATP working Paper No. 22, World Bank.
[27] Tournee, J. and Esch, W.V. (2001), Community Contracts in Urban Infrastructure.
[28] Ministry of Works, (2003a), *Labour-based Technology: A review of Current Practice* - proceeding of the 10th regional seminar for labour based practitioners, October 2003, Arusha, Tanzania.
[29] ILO (2009), Roll Out Seminar for Labour Based Technology: Up-scaling the use of Labour Based Technology in Tanzania.
[30] Msangi, H and Mujsers, G. (2003), Experience of Using LBT in Rehabilitation and Maintenance of District and Feeder Roads: Medium term impact on people and Government of Tanzania.

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