EVALUATING EMPLOYMENT AND COMMUNITY OPPORTUNITIES PRESENTED BY BUILDING AND CONSTRUCTION PROJECTS

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ABSTRACT

A procedure to assess and appraise opportunities presented by construction projects is developed. This procedure examines two types of opportunities, viz. employment and community opportunities. Opportunities in each of these categories are examined in detail and are optimised before being combined in a simple formula so as to index their contribution in these areas and to compare the effectiveness of a project's delivery with other projects. The potential influence of this type of project analysis on the RDP and the proposed NPWP is discussed.

INTRODUCTION

In South Africa, politicians, developmental organisations and communities have come to realise that the building and construction industry can be used to provide employment and to empower specific or targeted communities. The African National Congress's Reconstruction and Development Programme, the National Economic Forum's Framework for a National Public Works Programme and the objectives of the Framework Agreement signed by COSATU, SANCO, SAFCEC, SAICE, SARF, IMIESA and SAACE clearly spell out to varying degrees what the construction industry is expected to deliver in these area. Generally, these expectations revolve around four development areas, viz. the development of small scale enterprises, skills, entrepreneurship and employment opportunities.

Various construction practices have emerged in South Africa to address aspects of employment and empowerment. Labour-intensive methods of construction have been developed and employed on projects which include rural roads, low level bridges, dams, residential roads using waterbound macadam bases, concrete block paved roads, water and sewer reticulation for townships, bituminous surfacing of roads and low voltage electrical reticulations[1]. Labour-based technologies have also been developed to maximise the involvement of targeted labour in construction projects. At the same time, labour-intensive methods of construction and labour-based technologies are, in some instances, being linked to the development of small scale contractors, eg. the objectives of the Soweto Contractor Development Programme are to create employment opportunities for Soweto residents, to stimulate the development of contractors from amongst the local Sowetan population and to retain as much as possible of the expenditure within Soweto. It may be said that these practices are being used to alleviate poverty at one end of the spectrum and for affirmative action purposes at the other end.

Development support systems have also evolved to provide professional assistance and the resources lacked by local contractors (entrepreneurs) to enable communities to construct their own housing, infrastructure and amenities and to acquire skills and competencies in commercial, administrative and managerial fields. These support systems include[1]:

- Labour pool worker programme (NCLIC Framework Agreement Approach)
- Development Team Approach
- Managing Contractor Approach
- Main Contractor Approach
- Contractor Team Approach
- Mentorship Approach
- Joint Venture Approach

All these systems to a greater or lessor extent aim to create employment opportunities for a community and to facilitate the involvement of that community in a project. The question that begs asking is *how effective are the construction methods and technologies that are adopted and the aforementioned implementation approaches in benefiting a targeted community ?*

Currently, various statistics are being put forward to describe the success or otherwise of labour-based projects. These statistics are highly dependant on the method of measurement that is adopted. For example, Watermeyer and Band[1], on the basis of information received from those engaged in the Western Cape Bloekombos project (Framework Agreement accredited labour-based project), report that the overall increase in the number of manhours generated on the project as a whole is probably less than 250%. COSATU[2], on the other hand, report that *522 people are employed there, as opposed to 85 if conventional construction methods had been used - an increase of 600%.* Watermeyer and Band based their findings on the total number of employment opportunities generated including that associated with Preliminary and General items, the manufacture of materials and construction activities. COSATU, on the other hand, examined the increase in manual employment opportunities. There is accordingly a need to develop project evaluation criteria which may be used, in the first instance, to compare one technology or approach to implementation against another and thereafter one project against another using clearly defined statistics and a common approach to project evaluation. This paper seeks to provide and demonstrate such an approach. Terms shown in *italic* are explained in Appendix A.

EVALUATING PROJECTS

The approach

Watermeyer et al [3] have proposed a procedure to develop and appraise opportunities presented by construction projects. This procedure examines two types of opportunities viz employment and community opportunities. Opportunities in each of these categories are examined in detail and are optimised before being combined in a simple formula to index their contribution in these areas and to compare the effectiveness of a project's delivery with other projects.

In essence, this approach examines and evaluates the following:

- The *multiplier in employment opportunities*
- *Expenditure per unit of employment generated*
- The amount of *construction cost retained by the community*
- The cost of the proposed construction compared with that of conventional construction practices
- The quality of the end product compared with that produced using conventional construction techniques

The approach which is outlined presupposes that the desirability of a project has been established. It does not replace conventional methods of appraising projects eg. cost benefit analysis as its focus is on the choice of construction methods, technologies and practices and the structuring of construction contracts.

Employment opportunities

Employment opportunities should be assessed in the following manner:

1) Establish the *cost of construction* and the estimated total number of manhours generated using conventional construction technologies, methods and practices.
2) Explore possible *multipliers in employment opportunities* within elements of the project or specific activities which may arise from the employment of alternative construction technologies and methods.
3) Establish the *cost of construction*, the estimated total number of manhours generated and the *expenditure per unit of employment generated* using the technologies and methods contemplated in 2.
4) Minimise any cost premium and maximise the employment opportunities associated with different combinations of technologies and methods.
5) Select the construction practice which comprises methods and technologies which attract low cost premiums and generate employment opportunities in the most cost effective manner.
6) Evaluate the quality of the end product provided by the selected construction practice and compare with that using conventional construction practices. If acceptable, accept the chosen construction practice.

Expenditure per unit of employment generated may be used to evaluate the efficiency and effectiveness of the employment generated and define the employment-intensiveness of a construction project. To allow comparisons to be made, Watermeyer et al [3] suggest that all costs should be escalated or de-escalated, as appropriate, to the base month of July 1994.

Watermeyer et al [3] point out that the average *expenditure per unit of employment generated* in the civil engineering industry as a whole, obtained from statistics published in the January 1994 edition of the Civil Engineering Contractor, adjusted for employment generated in respect of materials manufacture using Watermeyer and Band's [1] site labour to materials manufacture ratio, were approximately R27-50, R31-00 and R33-50 for the calendar years, 1991, 1992 and 1993 respectively. This translates to a July 1994 value of about R37/manhour. Projects in Soweto's Contractor Development Programme, where labour-intensive methods of construction and labour-based technologies are employed, yield an *average expenditure per unit of employment generated* of around R17/manhour[3].

On the other hand, labour statistics generated by the Central Economic Advisory Service (1991) indicate that the agricultural, gold and clothing sectors employ approximately 40% more workers per unit of expenditure than is the case for the civil engineering sector. The *average expenditure per unit of*

employment generated for these sectors, as of July, 1994, is therefore, in the region of R27/manhour. Thus labour-based construction projects have the potential to generate employment opportunities at approximately half the cost of conventional construction and at about two thirds the cost of that of the agricultural, gold and clothing sectors.

Community opportunities

Community opportunities should be assessed in the following manner:

1) Examine the construction process and identify which aspects of the project may be undertaken by the targeted community.
2) Establish the resources of the targeted community.
3) Explore the various construction options, eg Conventional Contractor Approach, Labour Pool Worker Programme Approach, Managing Contractor Approach and Development Team Approach, Contractor Team Approach and Joint Ventures, and estimate the associated *cost of construction* and the percentage of *construction cost retained by the community* with each option, taking full cognisance of the resources of the community.
4) Select the construction option which maximises the percentage of *construction cost retained by the community.*

The *construction cost retained by the community* on projects where the community contributes only its labour will equate to the labourer wage bill paid to members of the community ie. the spending on targeted labour. Cost retained by the community provides a measure of aspects such as community involvement, affirmative action, redistribution of wealth, entrepreneurship and development. It is also a direct measure of economic empowerment. It furthermore reflects the degree to which local resources are employed in a project.

On projects in the Western Cape of a site and service nature, which are currently operating in terms of the Framework Agreement, the spending on targeted labour ie. the *construction cost retained by the community* amounts to 12% [1]. The construction cost retained by the community in Soweto's contractor development programme, has been found to vary between 37 (road construction) and 50% (plumbing) depending upon the type of contract. On a community-based pilot project in Sandton, involving the construction of water and sewer mains, this figure was found to be approximately 34%[3].

Project Index

Watermeyer et al [3] have established a Project Index (PI) to evaluate and compare projects against each other, viz:

$$PI = f_1 \frac{20}{EEE} + f_2 \frac{PCR}{100} + f_3 \frac{ECC}{EPC} \quad \ldots\ldots\ldots (1)$$

where f = A weighting factor
EEE = Estimated *expenditure per unit of employment generated* de-escalated to July 1994
PCR = Percentage of *construction cost retained by the community* (Rand/manhour)
ECC = Estimated cost of conventional construction
EPC = Estimated project construction costs

and $\frac{ECC}{EPC}$ □ 1,0 .....(2)

This index is in essence a combination of three ratios which relate to *expenditure per unit of employment generated*, *construction cost retained by the community* and *cost of construction*, respectively. Each of these ratios in their own right index employment opportunities, community opportunities and cost premiums ie. job creation, economic empowerment and cost efficiency. The PI, therefore, may be used to evaluate a project's contribution in respect of employment opportunities and to compare one project against another, irrespective of whether or not such projects incorporate labour-intensive methods of construction. Projects which have a high PI present more development opportunities to a targeted community than those having low ones. Threshold PI's can be set for specific project objectives and as such can be used as a basis to reject or accept certain projects. The Project Index may also be used to monitor and measure the change in spending patterns on projects as levels of spending on targeted labour increase.

It should be noted that in terms of formula (2), the PI is not increased should the estimated EPC be less than the ECC. A value of 1,0 should be assigned to the ratio ECC:EPC where projects do not involve the use of plant or for which an ECC is not relevant eg. masonry house construction, plumbing, etc.

Programme audit

Where projects within a programme attract cost premiums, Watermeyer at al, recommend that the programme as a whole be checked to ensure that a net "loss in physical assets" does not result. For a programme to have a positive delivery:

□ $\frac{ECC.PP}{EPC} > PRP$ .....(3)

where PP = project provision
PRP = programme provision

Where this is not the case, the provision made in respect of individual projects may have to be revised or an acceptable amount of "loss in physical assets" for the programme as a whole, will need to be established.

PROGRAMME AND PROJECT OBJECTIVES

The values of the weighting factors of equation (1) are dependant on programme and project objectives. In Soweto's Contractor Development Programme (CDP), where the index was first established, the programme objectives were described as being to *structure and to execute construction projects using labour-based technologies and labour-intensive methods in such a manner that through the construction process:*

- *Employment and entrepreneurial opportunities are created for members of the community.*
- *Skills and competencies in technical, commercial, managerial and administrative areas are transferred to participants.*
- *The percentage of the construction cost retained by the community is maximised* [3] .

Project objectives, on the other hand, could be described as being to *have the Works constructed to specification within a specified period and a given budget using community-based contactors and labour-based construction practices in such a manner that:*

- *Opportunities for employment and training are created for the local community.*
- *As much as possible of the project expenditure is retained by the community.*
- *Community-based contractors (local entrepreneurs) are developed from within the community.*
- *A sense of participation within the community is fostered.*
- *Members of the local community are, as far as is practicable, employed by the Construction and Materials Managers to assist them in the execution of their duties.* [4] .

It can be readily seen from the aforementioned objectives that the *construction cost retained by the community* is the most important ratio as this ratio indirectly reflects aspects such as community involvement, affirmative action, redistribution of wealth, entrepreneurship, development, economic empowerment, etc. At the same time, it was recognised that some incentive must be provided to encourage local manufacture of material. To accommodate both these considerations, a weighting factor of 1,75 was adopted for this ratio viz, a 25% weighting multiplied by a factor of 1,4 to transform the percentage of *construction cost retained by the community* to a percentage of construction labour cost retained by the community (materials costs assumed to be 40% of the construction cost). This in practice

allows "bonus points" to be scored should materials be manufactured on site or technologies which have relatively low materials costs be employed.

Values of unity were selected for the remaining weigthing factors. Equation (1), therefore became

$$PI = \frac{20}{EEE} + 1{,}75\,\frac{PCR}{100} + \frac{ECC}{EPC} \quad \ldots\ldots\ldots (4)$$

The Project Index calculated in terms of equation (4) can be used to measure whether or not a project complies with these objectives should a threshold PI be established. Assigning values of 20, 25, 1 and 1,15 (15% premium paid for labour-based construction) in respect of EEE, PRC, ECC and EPC, a threshold PI of 2,3 would result. Thus projects having a PI below 2,3 should be regarded as failing to comply with the aforementioned programme and project objectives.

Watermeyer et al report the following PI's:

Average PI for civil engineering industry as a whole assuming all labour by the targeted community	-	1,9
Western Cape Framework Agreement projects (site & service)	-	2,1
Road construction in Soweto's contractor development programme	-	2,6
Average for projects in Soweto's contractor development programme	-	2,8
Secondary water mains in Soweto's contractor development programme	-	2,8
Marlboro Gardens (Sandton) pilot project (water & sewers)	-	2,9
Plumbing in Soweto's contractor development programme	-	3,1

The Reconstruction and Development Programme (RDP)[5], on the other hand, suggest that one of the first priorities in meeting basic needs is to provide jobs (cl 1.4.2). In regard to construction, it suggests that *our people must be involved in these programmes by being made part of the decision-making on where infrastructure is located, by being employed in its construction and by being empowered to manage and administer these large scale programmes ... (cl 1.4.3) ... infrastructural programmes must take into account the implications for micro enterprises (cl 4.4.7.10).*

The RDP makes specific reference to Public Works and sets out that programmes of this nature should :

- involve communities in the process so that they are empowered (cl 2.3.6).
- create assets which are technically sound (cl 2.3.6).
- not abuse labour standards (cl 2.3.9).
- give priority to job creation and training (2.3.9).

- encourage and support self-employment through small and medium enterprise creation to ensure sustainability of skills (cl 2.3.9).

The RDP in terms of housing and services suggests that such programme should :

- incorporate the development of small, medium sized and micro enterprises owned and run by black people (cl 2.5.6)
- introduce support mechanisms in order to maximise the use of local materials (cl 2.5.19)
- encourage community-controlled building materials suppliers (cl 2.5.19)
- involve beneficiary communities at all levels of decision-making and in the implementation of their projects (cl 2.5.21)
- benefit the beneficiary community in matters such as employment, training and award of contracts (cl 2.5.21)

The project and programme objectives of Soweto's CDP are not dissimilar to the requirements of the RDP. Accordingly, equation (4) can equally be utilised to evaluate RDP construction related projects to ensure that such projects do in fact meet with the requirements of the RDP to an acceptable degree.

The key objectives of the National Economic Forum's proposed Public Works Programme are to:

- increase the income flows to the poorest sections of the community while simultaneously creating useful public assets.
- enable participants to acquire skills.
- strengthen the decision making capacity of poor communities and their ability to control their own environment.

The National Economic Forum commissioned an investigation into the shape of a future National Public Works Programme (NPWP). The report of the Technical Focus Group (National Economic Forum, 1994) presents a Technical Model for a NPWP in order to examine the potential employment creation in each sector. This model groups various construction activities into 5 sector groups in terms of their *levels of skills requirements and level of development of labour-intensive methods for each of the sector groups.* The Technical Focus Group also *estimated the potential increase in the proportion of the project costs which go to targeted labour in each sector* on the *basis of actual experience in South African projects, published data, and by calculation.* The sectors in which the potential increase in labour intensity was examined are shown in Table 1.

Table 1 : Spending on targeted labour as percentage of spending on labour, plant and materials (National Economic Forum, 1994)

SECTOR	CURRENT SPENDING	MAXIMUM SPENDING
Simple projects	60-80%	60%-80%
Low cost housing	25%-35%	30%-40%
Social buildings	20%-30%	25%-35%
Water reticulation	5%-15%	25%-35%
Stormwater	5%-15%	40%-50%
Sanitation	5%-15%	25%-35%
Roads	5%-15%	30%-80%
Dams	10%-20%	50%-80%
Railways	5%-20%	20%-30%
Forestry	25%-35%	35%-45%
Electrification	10%-15%	12%-17%
Small-scale agriculture-related infrastructure	40%-80%	40%-80%

Table 1 also shows the current spending in South Africa on targeted labour, ie the spending on target labour expressed as a percentage of the sum of the costs of all labour, plant and materials.

The Technical Model proposed time scales for the various sectors to change their spending patterns by using labour-intensive techniques to that proposed in terms of maximum spending. Where projects are structured to involve labour from a specific area as low skill workers on a project and the targeted community have little or no involvement in the commercial, managerial and administrative aspects of construction projects, the spending on targeted labour may be regarded as the cost of construction retained by the community. Assuming that the estimated expenditure per unit of employment generated is R20/manhour and the cost premium for the various sectors are as tabulated in Table 2, the PIs for projects, in respect of each sector, calculated in accordance with equation (4) will eventually reach the ranges as shown in Table 2.

Table 2 : Maximum spending levels in a NPWP measured in terms of the Project Index

SECTOR	ASSUMED COST PREMIUM AT MAXIMUM SPENDING LEVEL (%)	PI BASED ON MAXIMUM SPENDING LEVELS AND EEE = R20/manhour
Simple projects	0	3,1 - 3,4
Low cost housing	0	2,5 - 2,7
Social buildings	0	2,5 - 2,6
Water reticulation	0	2,5 - 2,6
Stormwater	10	2,6 - 2,8
Sanitation	0	2,4 - 2,6
Roads	15	2,4 - 3,3
Dams	15	2,8 - 3,3
Railways	15	2,2 - 2,4
Forestry	15	2,6 - 2,8
Electrification	0	2,2 - 2,3
Small-scale agriculture-related infrastructure	0	2,5 - 3,4

The project index can, in this instance, be used to monitor and measure the change in spending patterns on projects as current levels of spending on targeted labour increase. The index can also contribute to an acceleration of the process of reaching targeted spending levels in a cost effective manner. This can be achieved if the value of the PI for a given sector is used in the determination of the allocation of funding. Engineers will in this manner be encouraged and challenged to restructure projects and develop innovative technologies so as to reduce the cost of employment generated while increasing the amount of construction cost retained by targeted labour.

APPLYING THE APPROACH TO SOWETO'S CONTRACTOR DEVELOPMENT PROGRAMME

The Soweto City Engineers' Department has applied this approach to upgrading projects executed in terms of their Contractor Development Programme [3]. The results of their analysis are reproduced to illustrate the project evaluation process.

Tables 3 and 4 present the estimated manhours associated with each activity in the road programme. These figures are based on actual statistics derived from previous contracts and preconstruction estimates and include the manhours associated with the manufacture and transportation of materials to the site but exclude that associated with preliminary, and general items and management. Figures associated with plant-based and fully labour-based construction as derived by Watermeyer and Band [4] are provided for comparative purposes. The projects in question realise 75% of the potential employment available in respect of the waterbound macadam roads and 83% in respect of concrete block roads. This is due to Soweto's requirements for asphalt surfacing by conventional means and no on-site manufacture of materials.

The *multiplier in employment opportunities* in construction activities were found to be:

- excavate and backfill trenches for water reticulation - 1,9
- excavate, lay pipes and backfill water reticulation - 1,4
- construct waterbound macadam roads - 4,7
- construct concrete block paved roads - 2,3

The estimated total number of manhours generated in respect of materials, site labour and management for the various projects in Soweto are presented in Table 5. Table 6, on the other hand, present the *expenditure per unit of employment generated.*

The percentage of construction costs retained by the community is presented in Table 7 and summarised in Table 8. It should be noted that the community is not only involved in the construction contract but also in the transport of materials from the store to the site and in the development support provided by the construction and materials managers. The percentage of the management fee retained by the community varies considerably between construction managers and ranges from 25 to 45% of the total construction fee inclusive of site charges, establishment costs and disbursements. The percentage retained in respect of materials management costs is approximately 25%.

PI's for the various projects in Soweto's Contractor Development Programme, in terms of equation (4) were found to be:

- Roadworks (waterbound macadam) 2,6
- Roadworks (concrete block paving) 2,6
- Secondary watermains 2,8
- House connections (plumbing) 3,1

The provision in terms of the current CWRSC/DBSA loan agreement in respect of the projects which were evaluated were :

- Secondary watermains R9,0 million
- House connections R4,0 million
- Road construction R5,0 million

On these projects, the roadworks costs were found to be in the region of 15% more expensive than conventional construction whereas the secondary watermain costs were about 30% less expensive. Thus in effect, the monetary value of "physical assets" constructed in terms of the programme when compared to

conventional construction methods would equal 9 x 1,30 + 4 x 1,0 + 5,0 x 1,15 = 20,0 million, a figure in excess of the allocated project amount of R18 million. Thus the programme has a positive delivery.

T**able 3 : 5 m wide waterbound macadam asphalt surfaced road**

LAYER	TYPE	MANHOURS REQUIRED TO CONSTRUCT A SQUARE METRE OF ROAD		
		PLANT-BASED	LABOUR-BASED	SOWETO's CDP
Surfacing	20 mm	0,12	0,99	0,12
Basecourse	125 G2/WMB	0,17	1,72	1,72
Subbase	125 G6	0,13	0,60	0,60
Boxcut		0,20	1,85	1,85
Rip and recompact subgrade		0,03	0,35	0,35
Kerbing	Mountable	0,44	0,59	0,44
TOTAL		1,09	6,10	5,08

Table 4 : 5 m concrete block wide paved road

LAYER	TYPE	MANHOURS REQUIRED TO CONSTRUCT A SQUARE METER OF ROAD		
		PLANT-BASED	LABOUR-BASED	SOWETO's CDP
Surfacing	80 mm concrete block	0,93	2,12	0,93
Subbase	150 G6	0,16	0,70	0,70
Box cut		0,17	1,56	1,56
Rip and recompact subgrade		0,03	0,35	0,35
Kerbing	Mountable	0,44	0,59	0,44
TOTAL		1,73	5,32	3,98

Table 5 : Estimated number of manhours generated in Soweto's CDP

TYPE OF CONSTRUCTION	UNIT	ESTIMATED NUMBER OF MANHOURS/UNIT (hours/unit)			
		MATERIAL	SITE LABOUR	MANAGEMENT	TOTAL
Road construction (waterbound macadam + stormwater)	m5	0,5	6,8	1,8	9,1
Road construction (concrete block paving)	m5	0,7	8,0%	1,8	10,5
+ stormwater)	m	0,4	5,9	0,9	8,2
Secondary Water Mains	erf	0,6	31,4	6,0	38,0
House Connection					

Table 6 : Expenditure per unit of employment generated in Soweto's CDP

TYPE OF CONSTRUCTION	UNIT	ESTIMATED EXPENDITURE/MANHOUR (Rand)
Road construction (waterbound macadam)	m5	17,9
Road construction (concrete block paving)	m5	18,4
Secondary Water Mains	m	17,4
House connections (plumbing)	erf	17,1

Table 7 : Percentage of construction cost retained by the community in Soweto's CDP

DESCRIPTION	ROAD CONSTRUCTION	SECONDARY WATER MAINS	HOUSE CONNECTIONS PLUMBING)
Labour contract	26	22	33
Transport	2	8	9
Materials Management	2	3	2
Construction Management	7	6	6
TOTAL	37	39	50

Table 8 : Summary of percentage of construction costs retained by the community in Soweto's CDP

TYPE OF CONSTRUCTION	PERCENTAGE EXPRESSED IN TERMS OF		RATIO OF COLUMNS 2 AND 3
	CONSTRUCTION COSTS (%)	CONSTRUCTION COSTS LESS MATERIALS (%)	
Road construction	37	49	1,3
Secondary water mains	39	59	1,5
House connections (plumbing)	50	68	1,4

OTHER APPLICATIONS

Watermeyer [6] suggests that to both involve communities in the construction process and to ensure that communities derive the maximum benefit from construction projects, a development compact should be entered into between the community and the developer and/or local or regional authority. In terms of the development compact [7], the developer, prior to commencing with detailed aspects of the design, agrees to commission a pre-implementation investigation of the project so as to inform the community of the developmental opportunities and constraints presented thereby. Upon completion of this investigation, the developer is required to present the community with a report which, inter alia, sets out:

- *opportunities and constraints*
- *the contribution which local resources can make to the project*
- *the local skills which are available*
- *training requirements*
- *the proposed nature, structure and composition of developmental support which will be provided for emerging contractors and local enterprises*
- *the manner in which local labour will be engaged on the project; and*
- *the potential benefits which may accrue to the beneficiary community, including that relating to employment opportunities, the acquisition of competencies and economic empowerment.* [4]

The aforementioned approach to evaluating projects can prove to be an extremely useful tool in evaluating the various options and in presenting the findings of this investigation to the community. In particular, the evaluation of delivery systems (construction options) is of particular relevance.

Two of the three ratios which constitute the project index can also be used to establish tender preferences, ie those relating to *expenditure per unit of employment generated* and *cost of construction retained by the community*. This can be done in one of two manners should tenderers be required to provide details relating to the estimated number of manhours employment generated by work associated with the tender in question and the percentage of the tender price which is expected to be retained by the targeted community. Preferences can thereafter be structured around either the Project Index with a value of unity for the ratio relating to *cost of construction*, or the individual indices relating to *expenditure per unit of employment* or *cost of construction retained by the community*. Specific values for these parameters in respect of a particular project or component thereof, can be set. Preferences can thereafter be structured and granted in respect of tenders submitted which better these predetermined parameters. For example, a preference can be accorded to tenderers in proportion to the percentage improvement they propose on these predetermined parameters. Should this be done, a penalty clause must be included to penalise successful tenderers should they not achieve the parameters upon which they tendered.

CONCLUSIONS

The Project Index presented in this paper may be used to evaluate a projects' contribution in respect of employment and community opportunities and to compare one project against another, irrespective of whether or not such projects incorporate labour-intensive methods of construction. This is possible since the Project Index is a number arrived at by summating three expressions which, in their own right, index employment opportunities, community opportunities and cost premiums, respectively. Projects which have a high Project Index present more development opportunities to a targeted community than those having low ones. A single set of weightings can be used to index RDP related projects and to monitor changes in spending patterns in a NPWP. The approach to evaluating projects is extremely versatile and elements thereof can also be used to evaluate delivery systems, opportunities presented to communities and tender preferences.

REFERENCES

1. Watermeyer RB and Band NG. The development of small scale enterprises, skills, entrepreneurship and employment opportunities through the provision of housing. Working Group 3. National Housing forum. Nov, 1994.

2. COSATU. Letter to chair person of the National Housing Forum, October, 1994.

3. Watermeyer RB, Nevin G, Amod S, Hallet RA. An evaluation of projects within Soweto's Contractor Development Programme. J SA Inst Civ Eng, Vol 37, No 2, Second Quarter 1995.

4. Soderlund & Schutte Inc Community based Construction. Documents for implementation of the Development Team Approach, 1994a.

5. African National Congress. The Reconstruction and Development Programme : a Policy Framework. Umanyano Publications, Johannesburg, 1994.

6. Watermeyer RB. Community-based construction : a route to sustaibable development and job creation. Paper submitted to Civil Engineering for publication October 1994.

7. Soderlund & Schutte Inc in association with Project Management Techniques. Development Compact, November 1994b.

APPENDIX A : EXPLANATION OF TERMS

Multiplier in employment opportunities

The multiplier in employment opportunities may be defined as the ratio of the average total number of manhours generated in the construction of a specified structure or service using labour-based technologies to that using plant-based technologies. This ratio should include the number of manhours involved in the manufacture of materials, but exclude that associated with Preliminary and General items. This multiplier in effect gives an indication of the increase in the total employment opportunities generated by the selection of specific technologies. As such, this multiplier can be assessed by examining a specified sample length, area or unit, as appropriate, of the structure or service under consideration.

Expenditure per unit of employment generated

The expenditure per unit of employment generated should be based on the total employment opportunities which are generated in the construction of a structure or service and the total construction cost excluding VAT but including any management fees directly related to construction activities. Employment opportunities should, therefore, be expressed in manhours and include all the hours associated with Preliminary and General items, the manufacture of materials and construction activities. These statistics provide some indication of the cost effectiveness of the employment generated by the adopted technology.

Cost of construction

The cost of construction should include all costs pertaining to construction including any management and on-the-job training support costs provided to emerging contractors. Conventional professional fees relating to design and contract administration should, however, be excluded from such costs.

Construction cost retained by the community

The amount of the construction cost which is retained by the community gives an indication of the degree to which entrepreneurship and small scale enterprises is promoted in the community and is as such, one direct measure of economic empowerment within a community.