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1. Papers related to labour-based work in South Africa

1.1 *South African context and the lessons to be learned from Africa*

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**Introduction**

Drawing on the theory and practice of labour-intensive construction and maintenance, it will be argued in this paper that in South Africa unemployment (and thus poverty) could be alleviated (but not solved), public works constructed, and individual and community capacities created, through a well planned national employment creation programme using labour-intensive methods for the construction and maintenance of public works.

The dimensions of various problems in South African will first be sketched and then the reasons for the success of the national programmes in Kenya and Botswana will be summarised. Implications for South Africa will be derived. Various endeavours to implement labour-intensive work in South Africa, especially on a large scale, will be briefly described and analysed in the light of the work elsewhere in Africa. The paper will close with an outline of the process that should be adopted for a national employment creation programme.

**South African Context**

**Unemployment**

At least five aspects of unemployment in South Africa are disturbing. Firstly, the level is high and rising: from 7% in 1980 to 18% in 1991. Secondly, whereas in the early 1960s the formal sector had been able to absorb 81% of the annual net additions to the labour force, by the late 1980s this had shrunk to 8%. Thirdly, unemployment varies from region to region: 11% in the Cape Peninsula to an average of 29% in the former so-called "homelands". Even this latter figure does not capture the severity: in certain areas it has been estimated at 60%-70%. Fourthly, Wilson and Ramphele have given searing accounts of the deleterious effects on individuals of their being unemployed and research at the University of the Witwatersrand has shown that the combination of violence and unemployment has led to extreme levels of stress in the townships. Fifthly, examination of the unemployment problem reveals that the economy as a whole has become more capital-intensive. Between 1986 and 1990, for any additional expenditure, less than half the additional employment was created than during the period 1971 to 1980.

The importance of "job creation" has been acknowledged in many policy statements: it was one of the first items in the Development Policy of the ANC and featured prominently in the Report of the 1992 Economic Policy Conference of the Congress of South African Trade Unions (COSATU).

Undoubtedly one must look to political and social changes and to growth of the whole economy to solve the unemployment problem. However, not only is the South African economy either shrinking or barely growing but less employment is being created per unit of expenditure. Thus in addition to major emphasis upon policies to expand the economy, other policies are required to restructure current
activities so as to create greater employment opportunities per unit of expenditure within existing budgetary constraints.

**Housing and public works**

Government is faced with explicit demands for housing and public works. In urban areas the demand for housing has been estimated at between 198,000 and 328,000 units per annum for the next ten years. Municipal public works (water supply, sewerage, streets, stormwater drainage, electricity, waste disposal) will be required for such housing. Equally, in many rural areas there is need for public works (dams, irrigation, roads).

The demand for public works is being made while other voices are warning that insufficient funding is being made available for the maintenance of the public works already in place. For example, in relation to constructed gravel roads in Natal it is only possible to keep "25% of the network" adequately gravelled. In relation to the whole of South Africa it has been estimated that R5.5 billion is necessary "just to get the network into an acceptable condition".

While the magnitude of the problem is daunting, the provision of housing and public works would be an opportunity to generate employment. The building of houses is already relatively labour-intensive. However, civil engineering is typically equipment-intensive and would not generate that many jobs unless it became labour-intensive.

**Individual and community capacities in technical and institutional terms**

The previous two sets of problems must be seen within the context of two particular legacies of apartheid. Firstly, the Bantu Education Act of 1953, together with other legislated prejudices, led to the downgrading of mathematics and science in "black" (used instead of "disadvantaged") education to the extent that in 1990, of 10,000 "black" school entrants, only one will be eligible to study engineering or medicine at university (by comparison the UK ratio has been estimated at 1:40). This means that the black community is sadly disadvantaged in technical terms and specific efforts are required to foster individual technical skills. A corollary is that it is likely that technical work will continue to involve the white technical fraternity for some time to come.

Secondly, the formal institutions nominally responsible for public works in black areas were either within the essentially white public sector or (i) without widespread legitimacy, (ii) inefficient and (iii) corrupt. Although there has been rapid development of CIVIC associations and links between the CIVICS and white local authorities, the historical lack of a technical capacity and the absence of effective institutions means that any proposals for public works should bear in mind (i) the existing vacuum and (ii) the need to create local capacities for decision making, programming, planning, construction, maintenance, monitoring, control, accountability and evaluation.

Within such a context it is, therefore, important that measures to address problems should consider the process as well as the product. The provision of housing and public works should be an opportunity not only to create employment but also individual skills (technical, administrative, managerial, commercial) and community capacity to engage in the whole process of the provision, administration and maintenance of public works.

The need to generate greater employment opportunities per unit of expenditure, construct and maintain housing and public works and foster individual skills and institutional capacities has just been outlined.
From such a perspective it is worthwhile summarising the reasons for the success of the national programmes of labour-intensive construction and maintenance of rural roads that have been established elsewhere in Africa.

The reason for success of labour-intensive road construction and maintenance elsewhere in

Over the past twenty years labour-intensive road construction has progressed from being a hypothetical possibility to a practical reality. National programmes have been established in Kenya, Botswana, Ghana, Lesotho and Malawi; several pilot projects have been carried out in Ethiopia, The Gambia, Mozambique, Tanzania and Zambia. These projects and programmes have usually been initiated by governments as part of their policies for rural development, and have included the creation of employment opportunities, the provision of infrastructure and the fostering of agriculture.

Although there are significant differences between the national programmes the similarities are sufficient to conclude that within different institutional and organisational frameworks, a wide range of techniques of labour-intensive road construction and maintenance have been extensively tried and tested over the past 21 years. Local variations have resulted in experience under climatic conditions varying from arid to tropical; terrain conditions varying from flat to mountainous; traffic conditions varying from ten to several hundred a day; standards varying from spot-improvement to engineered gravel roads and haulage varying from tipper truck to donkey cart - the latter in relation to a relatively high standard of construction.

Institutional frameworks have varied from a Department of Roads within a Ministry of Transport to a Roads Unit within a District Council that was semi-autonomous from a Ministry of Local Government and Lands work has been implemented departmentally and by contractors. Workers have been employed on individual monthly contract or by contractors. In the early phases emphasis was upon the creation of employment opportunities for unskilled labour. Over time it became clear that the productivities achieved by organised labour could not be considered the result of unskilled work. Equally that to motivate labour to construct a sound product it is essential to train skilled supervisors who are technically and organisationally competent and that during training as much attention should be paid to character as competence.

Drawing upon experience and analysis of the programmes in Kenya and Botswana in particular, it is considered that the following are the main reasons for success:

1. Programmes were long-term and national.
2. There was a sound intellectual assessment of the technical feasibility and economic efficiency of using labour-intensive methods: cognisance was taken of technological and institutional capacities.
3. Technical, institutional, organisation and socio-economic aspects received concentrated attention during preliminary work, continued through pilot projects, embryonic training programmes, and subsequent national programmes. Technical matters included design, standards of construction, specifications, tools and equipment, and methods of construction. Institutional matters included the decentralisation necessary for grassroots success and the centralisation necessary to plan and coordinate a large programme. Organisational aspects included management structures and systems (recording, reporting, controlling, monitoring and evaluation) and training. Socio-economic aspects included wage rates, conditions of employment, labour supply, role of women and social
impact studies. Prior agreement was reached between the different parties with regard to wage rates, conditions of employment and the role and responsibilities of the community.

4. Strong organisations were established with good management systems; a balance was achieved between decentralisation and centralisation.

5. Training was extensive and good at what it set out to do.

6. There was long-term political support.

7. There was long-term financial commitment.

8. On balance there was good co-ordination between the government, government departments, those administering the programme, local authorities, those providing technical assistance and donors. This was facilitated by objective external advice by the ILO.

And the corollary: they were not short-term emergency relief projects.

Implications for South Africa

What are the implications of the national programmes elsewhere in Africa for South Africa?

Two broad sets of implications will be drawn, firstly related to labour-intensive construction, secondly to national public works programmes.

Firstly, the programmes in Kenya and Botswana have demonstrated that good quality, low-volume rural roads may be constructed and maintained by highly labour-intensive means: 5 to 7 times more employment being created per unit of expenditure. The increase was achieved by the identification of the type of work which could incorporate a significant increase of labour per unit of expenditure and then through extensive investigation of economically efficient implementation. Secondly, the potential was realised through the establishment of national programmes.

National programmes have been established through:

- the adoption of a long-term national perspective in which a programme is developed (Figure 1);
- attention to technical, institutional, administrative, organisational and socio-economic detail during the preparatory lead-in phase and throughout the programme;
- institution building at community, regional and national levels;
- extensive training at site, multi-site and national levels.

Recent labour-intensive construction in South Africa

Turning to actual developments in this field in South Africa: on his return to South Africa late in 1987, the author began to explore the extent to which the success of the programmes in Kenya and Botswana could be replicated in South Africa. Initially it was assumed that replication would only be feasible in rural areas because South Africa was far more industrialised and thus heavy equipment was readily available together with the operation and maintenance systems for achieving high productivity. Subsequent experience in South Africa has led to the conclusion that the degree of dislocation between the industrialised portions of South Africa and the remainder, means that the scope for labour-intensive methods is much greater than appeared at first sight, this view being strengthened by social and political factors.
Other conclusions have been derived from experience related to labour-intensive work in South Africa itself. Through extensive involvement in some projects, limited involvement in others and observation of the remainder, a broad perspective was gained of the recent development of labour-intensive construction in South Africa from its beginnings in a few brave initiatives to the present where hundreds of millions of Rand are being spent on so called labour-intensive work. The author will first provide a brief review and then focus upon the initiatives which have involved the greatest expenditure.

**Initial projects and relatively small-scale developments**

In the early to mid-1980s odd pilot projects of rural road construction were initiated in the Transkei and Kwazulu. These projects demonstrated that in South Africa labour-intensive methods could be used for low-volume rural road construction. However, none of these projects progressed beyond the construction of a short stretch of road. This is because they had been carried out on an ad hoc basis: the organisations responsible for the work were not linked into a regional or national institution, there was no programme for future work. Isolated pilot projects did not lead to programmes of construction.

During 1989 negotiations for a longer term programme were initiated in Kwazulu. Funded by the Development Bank of Southern Africa (DBSA) the Kwazulu Tribal Roads Maintenance Study was located within Kwazulu's institution responsible for Tribal Authorities with formal links to the Roads Branch of the Kwazulu Works Department (Roads Branch). The study led to the formation of the Kwazulu Tribal Road Upgrading and Maintenance Programme. Recently this has begun to develop along the lines of the programmes in Botswana and Kenya. The programme is now operational in over 20 Tribal Authorities and scheduled to expand to a further ten during the coming year and throughout all 230 over the next ten years. Policy is in place, funding has been committed, suitable posts in the process of being established and formal training will begin later this year. While progress is encouraging it must be pointed out that it has taken several years to establish the programme and many problems have had to be surmounted.

Similar initiatives elsewhere have not yet taken root in relation to rural road construction.

However, in the Transkei, starting in 1986, innovative work has been carried out using labour-intensive methods for the construction of a wide range of municipal public works in Ilinge (water supply and reticulation, sewerage reticulation and treatment, stormwater drainage and streets). Furthermore under the overall guidance of a consultant, small contractors were established and trained. In 1987 the consultant responsible for these innovations became involved in the upgrading of the water mains for the Soweto City Engineer's Department. Somewhat later this project became the Soweto Contractor Development Programme. In turn this has led to various small contractor development initiatives. Elsewhere one contractor has reported significant progress in relation to trenching for pipelines.

This work has demonstrated that in South Africa labour-intensive methods may be used for a wide range of civil construction. In the case of replacement of water mains and pipeline trenching, it has been demonstrated that the quality, cost and speed are comparable to equipment-intensive methods. The work in Ilinge and Soweto has also shown that small contractors may be developed capable of using labour-intensive methods. The main weakness of the work in Ilinge and Soweto is that it was project based - there was no long-term programme (learning curve, training, overheads).

Turning from projects to research for a moment: research in the Department of Civil and Environmental Engineering at the University of the Witwatersrand indicates that significant employment opportunities
may be created through the use of labour-intensive methods in the earthworks component of civil construction in general and for surfaced roads in urban areas in particular. A cursory analysis of the extent to which labour-intensive methods might be used in the earthworks component of civil construction was carried out by the author. This analysis would need refinement before it could provide an objective basis for predicting the order of magnitude of work that could be created and thus set criteria for achievement. The cursory assessment of the earthworks component of civil construction work undertaken within a part of the public sector indicated that the number of people employed in civil construction could be doubled. If this analysis of only a part of the public sector were to hold true for the whole industry, there would be employment opportunities for not less than 100,000 people.

In 1991 Phillips investigated the viability of reintroducing waterbound macadam as a base-course material. He found that there was the possibility for a ten-fold increase in the proportion of labour diverted to the construction of the base-course. Depending upon the assumptions made there was a financial premium of about 10 to 70 per cent. As part of his PhD he has carried out more detailed research into the financial trade-off between cost and employment; depending upon assumptions made employment could be increased by a factor of 40 (4,000 per cent increase). Such a finding encourages further research (in particular in terms of a national economic perspective) and must be of interest to anyone who is deeply concerned about the levels of unemployment.

Further research is being carried out to determine the number of employment opportunities that could be created throughout the various sub-sectors of civil construction. However, one may be fairly confident that in relation to the road network, potential for an increase in the employment of labour per unit of expenditure exists in the following categories:

1. rural roads: construction and maintenance of non-gazetted and tertiary roads;
2. urban roads and storm water drainage; construction and maintenance of primary distributors: sub-base, base course and wearing course.

In the meantime several public authorities and development agencies have attempted to increase the use of labour-intensive methods by putting the onus upon the contractor. The contract documentation has contained exhortations to use these methods "wherever feasible" or "whenever possible". There has been a singular lack of effect. Such conscience salving exercises have not only failed to understand that the greater use of labour-intensive methods starts with the design but also that at present the contractor is bound into a socio-technical system based upon the use of equipment and this cannot be changed overnight. On the one hand the designs, specifications and documentation hardly exist; on the other, the industry does not have organisational structures, planning, procedures and supervisors to handle highly labour-intensive construction works. However, we will see below that the industry may be influenced to move in that direction but this has to be from a national perspective and not from that of one contractor engaged on a single contract.

Large-scale projects and programmes

While the above projects involved several millions of Rand we will now turn to those that deal in billions: the Special Employment Creation Programme, the Strategic Oil Funds and the Independent Development Trust's Sites and Services Programme.

The Special Employment Creation Programme (SECP) was launched in 1985: "to provide temporary relief to the unemployed but to refrain from giving them handouts, and to deploy them as productively as
possible". This led to the commitment of large sums of money to so-called labour-intensive construction and maintenance. From April 1985 to June 1990 R719 million was spent on the Programme itself and R423 million on an allied Training Programme (but the training was not linked into the SECP). Funds were still being dispensed during the 1992/3 financial year. Thus well over a billion Rand has been spent through the Programme.

The entire Programme has not yet been systematically evaluated. However, various reports allow the following overall observations.38 The structure of expenditure meant that, in relation to the Programme itself, at best only half the money was allocated to the poor; in relation to the training component considerably less. In relation to projects with short term and temporary objectives:

- no permanent employment opportunities were created;
- no physical and social infrastructural assets were created;
- projects were not integrated into development programmes;
- projects were inadequately planned, designed, co-ordinated and implemented;
- institutional capacities were inadequate to deal with short-term programmes in addition to normal activities;
- in some instances permanent workers were replaced by temporary workers.

It has been reported that long-term projects did contribute to the creation of permanent employment opportunities and physical and social infrastructure. However, no evidence has been provided as to the balance of expenditure between the short-term and permanent aspects of the programme and there is no evidence that in the latter more employment was created per unit of expenditure. Thus, despite much bandying about of the phrase "labour-intensive", observation of several projects indicates that they were actually labour-extensive.39 Of greatest importance was the fact that this money was spent through at least 28 different institutions. Despite its title, the Special Employment Creation Programme was not a programme but mainly a number of poorly conceived, unplanned, uncoordinated projects. Its major weakness is that it was not a programme situated within a firm institutional base.40

In 1991 the South African Cabinet decided to allocate one billion Rand from the sale of strategic oil reserves to special programmes and projects which would benefit undeveloped areas in particular. The overall objective was to achieve the greatest possible degree of involvement, employment creation, meeting needs and stability through the most cost effective allocation of funds possible.41 The funds were allocated to various government departments and public sector authorities.

Once again, no scholarly review of the expenditure of the Strategic Oil Fund has been carried out. However, it is possible to discuss progress with respect to roads to which approximately R250 million was allocated. Less than three months were allowed for proposals to be submitted, work had to begin within three months of approval. A preliminary survey has shown that R125 million was allocated to authorities who used it for conventional equipment-intensive projects.42 Of the remaining R125 million well over half is being carried out labour-extensively, while the attempts to carry out effective labour-intensive work are severely hampered by the lack of the prerequisites enumerated earlier. A more detailed study has been completed which shows that only seven percent of the expenditure was on work which could be accurately described as labour-intensive.43 Similarly, one of the objectives of the IDT's sites and through the use of labour-intensive methods - given the lack of lead-in time there was a similar lack in effective use of labour-intensive methods. The ineffectiveness in relation to labour-intensive construction was not the fault of the executing agencies, apart from the use of rhetoric, but with
government which decided to spend several billion Rand with a lead-in time of 3-6 months. By contrast for a R100 million road project at least two years’ planning and preparation would be allowed.

The above review reveals negative and positive aspects. The vast majority of the expenditure on job creation has been unsystematic and certainly has not made effective use of labour-intensive methods (no institution, no training). The majority of the so-called labour-intensive work has either been conventional construction (i.e. product with no extra employment created) or labour-extensive. However, developments in South Africa have shown that good quality, cost-effective and timely construction can be achieved for a range of work far greater than low-volume rural roads. Equally that contractors could play a role in the execution of the work, provided that preparatory work had been done: designs, specifications, contract documentation and the training of personnel. Further expansion of employment creation in public works is limited by the lack of a long-term perspective, national planning and institutional development. Over the past two years there have been some positive developments in this direction.

Recent large-scale initiatives: Towards a National Public Works Programme

During 1992 a National Consultative Forum on Drought (now the National Rural Development Forum) was initiated. The Forum decided to set up four Task Forces, one of which was the Employment Task Force. In turn this task force has explored short-term and long-term options. In relation to the long-term it has made recommendations as to the pre-investment work that needs to be carried out for a National Employment Creation Programme using Labour-intensive methods for the Construction and Maintenance of Public Infrastructure (water supply, sewerage, roads, stormwater drainage, erosion control, irrigation, electricity supply and other physical infrastructure). An intrinsic part of this proposal is the development of individual and institutional capacity (community, local, regional and national): extensive training is envisaged. While the full benefits of such work would be revealed in a long-term programme, the short term has not been ignored. The pre-investment work for this programme has been taken forward by the National Economic Forum (NEF). Under the auspices of its Technical Committee (NEFTC) a pre-investment study has been carried out. On the 29 June 1994 the results of the NEF study were accepted by the Cabinet of the Government of National Unity as the basis of the National Public Works Programme (NPWP). The NPWP will not be a "tack-on" programme: it will cover all public expenditure on infrastructure for which it is feasible to use labour-intensive techniques. In essence the NPWP consists of a process of labour-intensification and increased training and capacity building in the provision of infrastructure. The NPWP is a key component of the government's Reconstruction and Development Programme (RDP).
1.2 The current context for Labour-intensive construction in South Africa

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Synopsis

The reintroduction of labour-intensive construction methods began in South Africa approximately 12 years ago. A number of pioneering projects have been undertaken and this has led to a growing understanding about, and acceptance of, the approach. With a change in government, and a change in the priorities for development towards employment creating opportunities, a shift to a labour-based construction paradigm has gained momentum.

Rural access roads are an area where labour-intensive methods are reasonably easily introduced and have therefore achieved some early prominence. The construction of urban roads, associated with the need for rapid housing opportunity development, will undoubtedly become an important aspect of labour-intensive construction.

Government has recognised the need to establish rules for ordering labour-intensive construction and has decided to adopt the Framework Agreement as policy. The Reconstruction and Development Programme which has as key performance indicators the efficient creation of necessary assets, together with employment creation, will give the entire initiative impetus.

Introduction

The use of labour-intensive techniques had been developing slowly in Southern Africa for the past ten or twelve years. Many of the early projects were in a rural setting with some of them being in the urbanised rural areas. More recently, however, a labour-intensive approach has been accepted in urban areas and increasingly projects such as Soweto, Johannesburg; Soweto by the Sea, Port Elizabeth and Umlazi, Durban have been the predominant projects with regard to implementation of labour-intensive ideas. While the use of labour-intensive methods will no doubt expand and serve an ever increasing important role in the development of rural communities the application to urban infrastructure development is likely to be most influential and in particular the greatest source of employment opportunities.

With the acceptance of the Reconstruction and Development Programme (RDP), and more particularly the National Public Works Programme Utilising Labour-Intensive Construction Methods (NPWP), great impetus will be given to the methods and the opportunity for employment creation will be greatly expanded. In addition the opportunity for entrepreneurial development in the field of material supply and as small contractors is obvious.

Current context

The Framework Agreement for Public Works Projects Using Labour-Intensive Construction Systems was developed on a tripartite basis between Industry, Labour and Civil Society. It subsequently took on board certain Government Departments and has operated in this guise for approximately 18 months (December 1994). Valuable lessons have been learned during the pilot phase of several projects and numerous comments have now been tabled regarding the applicability of the Framework Agreement
in the current circumstances.

What has changed since the signature of the Framework Agreement in June 1993 is that we have a new Government which has different priorities. It has been agreed that the New Framework Agreement should be integrated into Government and more particularly the Department of Public Works. In addition the RDP has been accepted as a framework for rectifying the inequities of apartheid regime. These inequities are being carefully examined across the board, but we are perhaps only interested in the technical field and in economic opportunities surrounding labour-intensive construction.

The concept of labour intensive construction and the concomitant increase in the number of employment opportunities created per unit of expenditure is in line with the RDP key performance indicators (KPI's). It is, however, felt that far more proactive decisions need to be taken to facilitate the entry of previously disadvantaged groups into the system, not the least part of which is the contracting arena. It is possible through labour-intensive methods to provide accessible opportunities for small black contractors, but it is necessary to rearrange the current paradigm surrounding construction to ensure that the inaccessibility of the past is removed. Special provisions need to be considered to ensure that those who were previously excluded are now specifically encouraged to become part of the contracting system. During the period of restitution declared by the Government of National Unity very specific and carefully directed initiatives will undoubtedly favour emerging black contractors. This will be part of the cost of rectification of the inequities of the past. Notwithstanding the fact that the entry of new players is to be encouraged it is still necessary to ensure that standards are not compromised and that, in particular, labour is not exploited. The maintenance of quality of assets and of acceptable labour standards is imperative. This is particularly relevant in urban areas where expectations of the type and standard of essential services is high.

Many of the projects which will be put forward over the next few years will have as a priority the KPI's enunciated in terms of the RDP. This provides a window of opportunity to introduce new methods to a very wide range of operations which currently do not favour the enhanced creation of employment opportunity. The Framework Agreement must therefore strive to take this opportunity and to provide criteria and guidelines to direct all involved towards the optimisation of the opportunities. It is proposed that certain criteria based on the RDP KPI's will become essential elements of any labour-intensive project. It is further proposed that a series of guidelines or statements of good practice will be provided to assist those making decisions in maximising the employment creation opportunities arising from the expenditure.

Tremendous support will have to be provided for the emerging contractor in the field of finance and personnel and technical management. These skills will be drawn essentially from the current established contracting fraternity, especially in the urban context. The problems approach to support for emerging contractors in rural situations is somewhat more problematic. The Framework Agreement will set out to establish the ground rules for relationships which will ensure skills transfer and access to the necessary resources which have previously been denied to small black contractors.

The new Framework Agreement therefore assumes an altered approach both to emphasise the altered environment and to provide clear guidelines to enable everyone involved to make the correct decisions.

**Labour-intensive construction**

Experience has shown that there is a need to differentiate between the various opportunities available for the use of labour-intensive construction. Depending on the circumstances the level of applicability, and
the need for control, needs to be modified. In terms of the new Framework Agreement (which has not yet been finalised) three types of contracting are identified namely, community-based, labour-intensive and conventional contracting. Conventional construction is regarded as construction which would not normally lend itself to labour-intensive methods. The intention is that the greatest level of interest from the point of view of control and monitoring will be directed to labour-intensive construction. The more difficult area is community-based construction where it is envisaged that projects promoted, and essentially implemented, by communities will fall. The intention is that very few controls will be placed on these contracts from the point of view of wage and labour standards and that communities will be able to make whatever arrangements suit their circumstances to achieve project realisation. Obviously from a funding point of view a level of quality of product will have to be maintained and the involvement of professionals is inevitable. The concept of community-based construction has not been fully defined at the time of writing. However, it is felt that the controls and standards will evolve with time and they are not dealt with in great detail hereafter.

The contracting arena

Assuming for the moment that we will deal exclusively with that band of projects which can be regarded as labour-intensive in terms of the definitions given above. There are several methods of implementation currently in force in South Africa and these will all be dealt with briefly.

1. Direct employment

Many funding authorities have the capacity and the desire to implement projects using what could be called a "force account" (also known in South Africa as Labour Pool Worker Programme Approach). The method of organisation of this work force varies and may include the creation of teams with team leaders, who assume a quasi-contractor role, or simply allow for each worker to work directly under the direction of support staff supplied by the promoter of the project. There is no concept of a true contractor, but each labourer effectively enters into a contract (possibly in terms of a draft contract document attached as Annex 1) which relates remuneration directly to productivity. The task base method of payment is a cornerstone of this approach. Involvement of outside professionals is at the discretion of the promoter of the project, but apart from the normal design and documentation function the professionals stand in as part of the support structure and not as contractors.

2. Small local contractors

There is tremendous pressure, particularly on the part of the National Association of Black Contractors and Allied Trades (NABCAT), for a greater percentage of contractual expenditure to be made accessible to small black contractors. It was felt that the Framework Agreement excluded these contractors in the past or at best did not provide specific access for them. The Framework Agreement is being redrafted and tender regulations are being examined to facilitate access of previously disadvantaged contractors. This is not to say that this level of contractor has not been used in the past. In the majority of the infrastructure development in Soweto use has been of local small black contractors who rely on a "project manager" to provide the support functions normally associated with larger contractors (Annex 2 illustrates a possible functional organogram for this scenario). One variation of this theme is the development team approach being utilised in Soweto where all role players in the development process operate in a concerted way to achieve the creation of the necessary asset. Variations on normal contract conditions are necessary to
accommodate contractors who do not have required financial resources, but essentially the contractual relationship between the contractor and the employer is as commonly expected in the contracting arena.

3. Major contractors

As the use of labour-intensive construction has grown interest on the part of major contractors has also grown. The need to involve small local contractors, however, remains and therefore the procedures being adopted are that major contractors with adequate resources set themselves up to manage a range of small local contractors very much like the "project managers" mentioned above. The rationale for this is that major contractors have the resources, have the background and a clear understanding of the necessary contracting procedures to place them in a position to provide the necessary support for small local contractors. The relationship between the main contractor and the small local contractors is generally one of contractor to sub-contractor. Efforts are now being made to develop a joint venture approach to provide more empowerment to the small local contractor. There are, in addition, certain instances where major contractors are not creating a contractor/sub-contractor relationship, but are forming workers into teams in their direct employ on an individual contract basis to do certain defined parts of the works on the basis of tasks. Effectively this work is being done on a team task basis with the leader of the team being responsible for the performance of a group which he may or may not have the ability to choose. Despite the problems which have been, and no doubt will be, experienced relating to the involvement of conventional contractors in this field it is felt that in the short to medium term this route is likely to be the most effective as the skills and financial muscle required for infrastructure projects is firmly situated in the conventional construction arena.

4. Other forms of contracting

Several other forms of contracting have been tried out in South Africa, but will not be discussed in detail here. Perhaps the most significant are those which would use small contractors having themselves directly contracted with third party contract support organisations, another is a method whereby professionals (generally consulting engineers) accept broader responsibility for construction of the end product by way of plant hire and small contractor or force account management.

Key performance indicators

Although many who have been involved in a labour-intensive approach have identified certain objectives to be attained through the use of labour-intensive construction. These objectives, monitored by performance indicators, have largely been random in nature and selected by the promoters or the professionals. As part of the RDP a series of key performance indicators (KPI's) have been developed to be a basis of appraisal of RDP projects. Although the core KPI's revolve around the more conventional engineering oriented issues there are several soft issues introduced which relate to community involvement and social issues. The RDP KPI's are as follows:

- **Progress against time**

  It is intended that any project will be prefaced by a business plan and that the progress and implementation will be measured against this plan, particularly in regard to time. This is regarded as a vital indicator as one of the fundamental criticisms of the labour-intensive
approach is that it is incapable of incorporating a given time schedule.

- **Cost**
  
  Again in terms of the business plan an accurate track of the cost of a project is required. It is important to monitor the cost of a project particularly where the tendency for the costs associated with the labour-intensive portion thereof to be regarded as subject to some indeterminate premium. Where a social cost benefit is identified the cost thereof, if any, is to be budgeted for and monitored independently.

- **Quality**
  
  The third of the performance indicators which could be regarded as technical is that of the maintenance of quality. This will ensure the creation of appropriate assets within the constraints of the specification and budget.

- **Job creation**
  
  A vital element of the RDP is the creation of employment. This KPI, when properly applied, will provide vital information regarding the increase in the number of people employed per unit of expenditure on a particular project relative to conventional construction. Factors such as gender and age breakdown are also monitored as this information is required on a national basis by the RDP.

- **Reaching targeted groups**
  
  The intention of the RDP is to benefit the most needy in the first instance. This "targeting" needs to be monitored and reported upon in categories such as single women, rural unemployed, urban youth and residents in less formal settlements. The RDP has already set out to target the regions with the assessed greatest need.

- **Human resources development**
  
  Reporting is required about the training and capacity building under headings such as construction specific skills, generic training and capacity building of communities. A careful check regarding the usefulness, appropriateness and adequacy of training will be maintained.

- **Community participation**
  
  Indicators highlighting the level and effectiveness of community participation with regard to decisions at all stages of the project are required. The degree to which the decision making structures are representative and transparent is to be monitored.
1.3 Labour-based construction and the development of emerging contractors in South Africa

R.B. Watermeyer Soderlund & Schutte Inc

Executive summary

Traditionally, the construction industry has been viewed as an industry which produces a high rate of employment per unit of expenditure. The industry as a result has attracted much interest and investment in efforts to create job opportunities. The civil engineering construction industry is, however, very reliant on heavy construction plant such as graders, bulldozers, excavators and the like and there is considerable room for substituting men for machines to increase employment opportunities.

In recent years South African civil engineering projects have been critically examined to see if more job opportunities can be created to provide relief to the masses of unemployed. As a result, the terms labour-intensive, labour-based and community-based construction have entered the vocabulary of South African engineers.

At the same time, engineering services and structures have been constructed by established contractors who have all the necessary resources required to execute projects, viz. labour, materials, machines and the necessary finances or access thereto to secure contracts. Small scale enterprises located within local communities have been excluded from participation by the very structure of the industry. Barriers to entry which effectively prevent local entrepreneurs or emerging building contractors from engaging in construction contracts, include lack of financial resources, inability to obtain credit, lack of credibility, lack of commercial, managerial, administrative and technical skills. In civil engineering projects, sureties, plant-based construction practices and tendering and contractual requirements effectively exclude all such involvement.

Labour-based construction can be closely linked to the targeting of employment opportunities. The question "How many employment opportunities are created?" is just as important as, "Who is to be employed, or which person will benefit from the construction process?"

Over the past few years, systems have been developed to support the emergence of entrepreneurs using labour-based construction methods within targeted communities. This form of construction may best be described as being community-based. Community-based construction may be defined as the use of labour-based technologies and labour-intensive methods on projects in which the community is, in addition, involved in the commercial, managerial and administrative aspects so as to maximise the amount of funds retained within the community and to transfer skills and competencies to the community.

The focus in community-based construction projects is on involving the community in the management and administration of labour-based construction projects, to promote the emergence of local contractors and to mobilise and utilise the resources of the community in an optimal manner.

In community-based projects, members of the community can also become involved in the operation of stores facilities, the support provided to local contractors, the transport of materials to local labour-only
contractors, the manufacture of certain materials, the supply of minor materials, and security of the site. Community-based construction has, however, enabled the necessary developmental support structures to be established. This, in turn, has led to the development of contractor development programmes for civil, electrical and building contractors, which enable emerging entrepreneurs to acquire and develop commercial, managerial and administrative skills while gaining credibility in commercial circles and assuming more contractual responsibility.

Certain restructuring of the industry will need to take place to enable small scale enterprises to have an adequate market share and to change the existing distribution of large, medium and small construction companies currently operating in South Africa. However, should the formal sector work together with the informal sector, contractors can develop together to the benefit of all.

Aspects of emerging practices and contractor development programmes are reviewed in the text.

**Introduction**

All civil engineering and building projects create a variety of job opportunities. Labour is required to manage and carry out the construction process, to handle materials and to operate and maintain the plant/machinery used. At the same time, opportunities are created for materials suppliers and manufacturers, financial institutions and professional firms. Indeed, construction projects offer meaningful employment opportunities to a wide spectrum of the labour force, ranging from unskilled workers to professionals.(Watermeyer, 1993 a).

In recent years, following the successful implementation of job creation programmes in Kenya and Botswana, South African civil engineering projects have been critically examined to see if more job opportunities can be created to provide relief to the masses of unemployed. As a result, the terms labour-intensive, labour-based and, more recently, community-based construction have entered the vocabulary of South African engineers. At the same time, labour-based construction has been linked to the development of emerging contractors.

This paper reviews some of the current trends, thinking and practices in the construction industry.

**South African construction practise**

**Trends**

In recent years, the South African civil engineering industry has followed North American and European mechanisation trends and has favoured plant over manual labour. However, the ever rising cost of such plant and the ever increasing levels of poverty and underemployment have caused the industry to re-examine this policy. At the same time, funding bodies such as the IDT, the DBSA and the Department of Transport and forums such as the National Economic Forum have recognised the potential for job creation in the civil engineering industry should labour-intensive methods of construction be employed and have encouraged the industry to make more use of labour by making funds available for labour-intensive type projects.

Employer, professional and worker bodies representing the industry, namely, SAFCEC, SAACE, SAICE, IMIESA, SARF, COSATU and SANCO became signatories to a Framework Agreement for use on public works where labour-intensive and labour-based construction systems are employed. This frame
work agreement provides guidelines for the preparation of contract documentation, training systems and task-based payment systems and conditions of employment as well as criteria for the selection of persons for employment.

**Current practice**

The civil engineering industry in South Africa differs in many respects from the building industry. The building industry, particularly in the area of house construction, has developed and promoted the emergence of small contractors who may operate at one of three levels, viz., they may provide all the labour and materials to construct the complete house, or they may provide labour only, or they may provide labour only for a specific trade. Small contractors able to operate at one or more of these levels in the building industry can be found within a large number of communities in South Africa. This is not, however, true of the civil engineering industry (Watermeyer 1993 b). The current Wage Order which is issued in terms of the Labour Relations Act of 1961 and regulates employment conditions in the civil engineering industry, does not permit the use of task-based payments on projects. Consequently the agreement in principal on the introduction of a task-based payment system by the participating bodies in the Framework Agreement is of major significance to the industry.

Traditionally, engineering services and structures are constructed by established contractors, whose operations are highly mechanised. These contractors possess all the resources required to execute the projects, viz., labour, materials, machines and money. They have the finance required for salaries and wages and the purchase of materials, the credibility in commercial circles to obtain sureties, to open accounts with suppliers and to hire plant, the managerial, commercial, technical and administrative skills required to secure and execute contracts. The bulk of their labour force is, normally, recruited from a specific area and, as a result, the community for which the service is constructed is, in the end, left with the service, but with little else, since a negligible percentage of the money spent on the project stays within the community (Watermeyer 1993a).

The barriers which prevent local entrepreneurs or small building contractors in a local community from engaging in civil engineering construction are (Watermeyer, 1993b; Watermeyer and Davis, 1993):

- Tendering and contractual requirements, such as the provision of sureties, the inclusion of penalty clauses and the tendering of rates.
- The prevalence of plant-based construction practices.
- The lack of financial resources to purchase materials, hire plant and tools and to pay wages.
- The lack of credibility in commercial circles.
- The lack of commercial, managerial and administrative skills.
- The discontinuity of work.
- The lack of technical competence.

A recent survey was conducted on behalf of the National Housing Forum into the barriers which prevent small scale enterprises from realising opportunities presented by the provision of housing (Watermeyer and Band, 1994). Different categories of opportunities were examined, viz. construction of houses, construction of infrastructure, manufacture of materials, construction of amenities, provision of transport, maintenance of services and buildings, selling and renting and the provision of professional services. The writers of the report, after analysing the responses to a questionnaire, concluded that:
Lack of financial resources, with the exception of the selling and renting category, appears to be the main barriers to entry.

- Inability to obtain credit where purchase of materials is required is a major barrier to entry.
- Lack of credibility, with the exception of the categories for manufacture of materials appears to be a major barrier to entry.
- Lack of commercial, managerial and administrative skills, lack of technical knowledge and discontinuity of work, may be regarded as major barriers in most categories.

The writers of this report also remarked that in none of the categories was numeracy or literacy seen to be a major barrier, and that with the notable exception of the category for construction of houses, lack of technical knowledge/expertise is considered to be a major barrier.

**Emerging practices**

In South Africa, machines are available to facilitate most aspects of construction. Consequently, established construction practices in South Africa have become plant-based and projects are planned and designed around the plant available. As a consequence, labour-intensive and labour-based construction practices are approached differently to elsewhere in Africa.

Before embarking upon a particular construction project it is important to have a clear and fundamental understanding as to what is meant by the various terms and how each form of construction differs from each other. Plant-based, labour-intensive, labour-based and community-based construction may be defined as follows (Watermeyer and Band, 1993):

**Plant-based construction**

The effective employment of technologies in the implementation of projects which are designed to maximise the use of plant and minimise the size of the workforce.

**Labour-intensive construction**

The substitution of labour for construction plant in plant-based projects to achieve as great a component of labour on a project as is technically feasible, whilst achieving the standard of construction specified.

**Labour-based construction**

The effective employment of appropriate technologies and labour-intensive methods on projects which are specifically designed to maximise the involvement of a workforce recruited in a specific locality and the transfer of skills and competencies to that workforce.

**Community-based construction**

The use of labour-based technologies and labour-intensive methods on projects in which the community is, in addition, involved in the commercial, managerial and administrative aspects so as to maximise the amount of funds retained within community and to transfer skills and competencies to the community.

There are fundamental differences between labour-intensive, labour-based and community-based construction. Labour-intensive construction is concerned with substituting labour for capital intensive plant and as such is concerned with increasing the number of employment opportunities per unit of expenditure. Labour-based construction, however, incorporates a blend of labour and light equipment. It
uses labour-intensive construction methods but with the aim of creating employment opportunities for work forces in targeted localities, with a specific view to transfer skills and competencies to that work force, i.e. it seeks to mobilise and utilise local labour resources. Labour-intensive construction seeks to maximise the use of labour; labour-based construction to optimise the use of labour. Labour-intensive construction serves, in the short term, to increase the number of unskilled jobs available and provides a measure of relief to depressed communities. Labour-based construction, on the other hand, benefits a community by not only creating employment opportunities but also by facilitating the acquisition of technical skills. In community-based construction projects, the focus is on involving the community in the management and administration of labour-based construction projects, to promote the emergence of local contractors and to mobilise and utilise the resources of the community in an optimal manner.

The goals and objectives of these forms of construction are very different. The benefits accruing to a community depend upon the construction method that is adopted.

With regard to targeting, labour-intensive construction is concerned with the increase in the number of employment opportunities that are created; labour-based construction with the earning capacity and increase in spending on the local labour force and community-based construction with the amount of project expenditure retained by the community.

**Labour-intensive and labour-based construction**

**General**

The ILO has been involved in a world employment programme since 1970 which has sought to substitute labour for capital in a cost effective way. Its focus, however, has been on the construction of rural roads. The ILO's experience of Public Works Programme in Africa, albeit multisectoral at the outset, is that these programmes camp around the construction and maintenance of rural roads and occasionally include irrigation works. Recently, the organisation has been mobilising communities to work on their own needs in urban areas where unlined open drains have been constructed to attend to stormwater problems (Morris 1994).

The roads which have been constructed in these rural road programmes are classified as low (less than 20 vehicles/day) and medium volume roads (up to 100 vehicles/day) (Morris 1994), e.g. in Kenya the typical design standards were 10-30 light and medium vehicles per day in all weather passage at a speed of 30 km/h (McCUTCHEON 1989). With regard to the irrigation projects, all pipelines were gravity (as opposed to pressure) pipelines (Morris 1994).

In South Africa, on the other hand, labour-based methods of construction have been employed on projects which include rural roads (Markman 1991, Boothway 1993, Scott 1993), low level bridges (Otte et al 1993), dams (Manson 1993), residential roads using waterbound macadam bases (WATERMEYER 1992, Harrison 1993), block paved roads (Kelly 1993), water and sewerage reticulations for townships (SAXBY 1993, Watermeyer 1993a, b, Powers et al 1994), bituminous surfacing of roads (Powers et al 1994) and low voltage electrical reticulations (WATERMEYER 1993a, b).

Traditionally, the construction industry has been viewed as an industry which produces a high rate of employment per unit of expenditure. Labour-intensive methods of construction and labour-based technologies have been effective in improving upon these figures; e.g. in Soweto's Contractor Development Programme, the multiplier in employment opportunities has been found to be (WATERMEYER...
et al 1994):
  ● excavate and backfill for water reticulation - 1,9
  ● excavate, lay pipes and backfill water reticulation - 1,4
  ● construct concrete block paved roads - 2,3
  ● construct waterbound macadam roads - 4,7

The average cost in South Africa to generate a man-hour of employment in the civil engineering industry currently amounts to R37. The building industry, on the other hand, is less machine orientated and, to a large extent, is labour-based by nature. In house construction, depending upon the standard of housing required, the cost per man-hour of employment generated lies between R19 and R28 (Watermeyer and Band 1994).

The current cost per man-hour of employment on projects involving the construction of water pipelines and surfaced roads in Soweto, where labour-based construction practices are employed, ranges from R17 to R19 (Watermeyer et al 1994). Labour-based construction practices have enabled the construction of township services to yield more employment opportunities per unit of expenditure than is the case for house construction.
1.4 A practical application of the framework agreement

M. Stofberg, Power Construction

Introduction

Labour-intensive or labour-based construction have become the "buzz words" in the civil engineering industry in the 1990's.

Over the past three years or more, there has been an increasing desire or request for industry to increase the labour component of civil construction. This emerging desire was largely due to the unemployment level in the country, which has been reaching alarming numbers.

Labour-intensive construction may be defined as the economically efficient employment of as great a proportion of labour as is technically feasible to produce as high a standard of construction as demanded by the specifications and allowed by the funding available.

Labour-intensive construction is the optimum substitution of labour for equipment in the execution of civil engineering works. By comparison with conventional equipment-based methods, the use of labour-intensive methods results in the creation of a significant increase in employment opportunities per unit of expenditure.

As awareness of labour-intensive construction and its benefits to particular communities grew, there was a growing tendency for funding authorities to insist that construction work was undertaken using these methods. This led to a growing interest on the part of the contracting community who wished to become involved, but who suffered from a lack of normalisation of the approach and of the "rules" applicable to labour-intensive construction as it was being developed. As the volume of work which was to be undertaken in a labour-intensive manner grew, the divergence of approaches increased and to some extent confusion and dissatisfaction on the part of all concerned parties arose.

The National Committee for Labour-Intensive Construction (NCLIC) was established to represent the interest of the formal industry including the contractors, design professionals and local authorities (South African Federation of Civil Engineering Contractors, South African Association of Consulting Engineers, South African Institution of Civil Engineers of South African Road Federation, the Institution of Municipal Engineers of South Africa). NCLIC initiated discussion with the Congress of South African Trade Unions (COSATU) and with the South African National Civic Organisation (SANCO) with a view to drawing up an agreement which would be a guideline for the further implementation of labour-intensive construction methods.

The framework agreement

These negotiations led to preparation of the Framework Agreement for Public Works Projects Using Labour-Intensive Construction Systems" which was formally ratified by the subscribing parties on 22 June 1993.

National Co-ordinating Committee
Initially there was a Co-ordinating Committee consisting of NCLIC, COSATU and SANCO. However, as stated earlier, any Government is a key role player into the allocation of the funds for infrastructural projects and therefore meetings were held with various Government Departments to encourage them to join the Co-ordinating Committee. The National Co-ordinating Committee (NCC) was formed and includes a representative from each of five Government Departments, namely, the Department of Transport, Department of Manpower, Department of Public Works, Department of Water Affairs and Forestry and the State Tender Board. (see Annex).

Accreditation Board

It was decided by the NCC that a series of pilot projects should commence in various regions throughout the country both in rural and urban areas. In order to identify these projects, an interim Accreditation Board has been set up consisting of 5 representatives from NCLIC, 2 representatives from COSATU/SANCO, 1 representative from the Department of Manpower and 1 representative from the Development Bank of Southern Africa. (see Annex).

Projects to be constructed under the Framework Agreement must be approved by the Accreditation Board. The funders of a project must apply in the first instance to the Accreditation Board and give full particulars of the project details on prescribed application forms. Once the project has been accredited, it is envisaged that it will receive automatic exemption from certain aspects of the existing Wage Order for Civil Engineering projects, thus clearing the way to implement the task based system of payment and conditions of employment as set out in Annex IV of the Framework Agreement.

The Bloekomboks Labour-intensive Construction Project at Bloekomboks Kraaifontein

Bloekomboks is an informal settlement 1 km east of Kraaifontein with approximately 2,000 families.

Due to the difficulties associated with in-situ upgrading, it was decided to provide serviced plots on the 65 ha open land next to the existing informal settlement.

The funding body, WCPA and the consultants approached the community during June 1993 when the project was initiated.

The project was structured with full community involvement.

It was requested and agreed that the contract will be done on labour-intensive methods to create as many as possible job opportunities.

The project was structured to be carried out in terms of the Framework Agreement for public works projects using labour intensive construction methods.

Application for accreditation to the Accreditation Board was made and the Bloekomboks project became the first accredited labour-intensive project in South Africa.

The aim of the project was to create job opportunities and training for approximately 450 people and to provide services, streets, water, waterborne sewerage system and electricity to 1885 erven.

The project consists of the following:

- Site clearance.
Contractors were appointed during November 1993. The total contract value of the project is R18 million. The construction period is 12 months and the planned completion date of the contract is the end of November 1994.

Currently the construction works is on schedule and the spending is within the approved budget.

**Successes**

- Over 560 people have been trained in various skills during the contract and 520 people were employed during the construction phase of the project. These people earned an average of 1.5 times the agreed task rate per day.

  This contract therefore provided job opportunities for people who otherwise would have been unemployed. The money earned uplifted the community's standard of living. Families that were sharing houses now had the opportunity to occupy their own and those that were dependent on others are now independent.

- Through the training that was done the people acquired certain skills that would enable them to be utilised on the contracts as sub-contractors or as future maintenance units within Bloekombos development.

- Team leaders acquired supervisory and organisational skills.

- Through the task based payment system the people are made aware that remuneration is linked to productivity, e.g. the more they produce the more money they take home.

- Through the meetings and discussions that are held on site between worker representatives and management, the fact was emphasised that they, the workers, also have the opportunity to air their views.

- The people acquire basic numeracy training through the method of measurement and payment used on this project.

- On a normal contract approximately 80 people would be employed where on this project approximately 520 people were employed.

- Bank accounts were opened for the team leaders who paid the individuals in their teams with cheques giving them the opportunity to manage money.

**Problems encountered**

The Framework Agreement was never really field tested and certain shortcomings created problems e.g.:

1. Task based work was initially unacceptable to the workers.
2. Initial negotiations with the workers to determined task sizes.
5. UIF: People insisted to take part in the fund although they were temporary employed.
6. Disciplinary and grievance procedure.

Annex 1
1.5 Choice of technique analysis

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Executive summary

Labour intensive construction involves the use of labour rather than machines, where technically and economically feasible. The authors have attempted to develop a methodology (Choice of Technique Analysis (COTA)) to enable the limits of technical and economic feasibility to be determined in a simple and consistent manner. The authors have developed COTA as a decision-making aid (a set of principles and a methodology) for government bodies charged with ensuring that publicly owned infrastructure is provided in a labour-intensive manner.

Such a methodology must be flexible and must incorporate a monitoring and feedback mechanism, in order that improvements in labour-intensive construction technology and practice can be taken into account. In addition, the inputs to cost calculations should be treated as variables, rather than as entities with fixed values, in order for the methodology to successfully model a changing environment.

The economic, social and political benefits of creating employment opportunities should be considered in the determination of economic feasibility. However, the cost comparisons in COTA have a more limited focus than those usually carried out in orthodox social cost benefit analysis - it is assumed that a decision has been made to build the infrastructure, and the analysis focuses on the relative costs and benefits of using different construction techniques.

The underlying principles are discussed, and thereafter a schematic representation of COTA is presented and explained in the paper.

Introduction

An incremental reorientation of public sector expenditure on infrastructure towards the use of more labour-intensive construction techniques over time would be a partial remedy to the problems of unemployment and poverty (McCutcheon, 1993). Choice of Technique Analysis (COTA) is an analytical tool to assist funding bodies to manage the complex process of increasing the labour intensity of construction techniques. The complexity of the process is due to the need to ensure that the increase in labour intensity in construction takes place without sacrificing the quality and cost of the assets produced. COTA is based on earlier work by the ILO (Costa et al, 1976:iv-18; Edmonds and de Veen, 1991:14; Garnier, 1982).

The basic principles underlying COTA

An incremental approach to increasing labour intensity In some types of public works, such as masonry stormwater and water crossing structures, construction techniques are conventionally (i.e. currently) highly labour-intensive. Thus labour-intensive construction of these types of works may be carried out without a prior period of technical development work, training, capacity building, and related institutional changes.
However, other types of public works, such as surfaced roads, are conventionally built using highly mechanised construction techniques. In order to ensure high quality and reasonable financial cost, labour-intensive construction of these types of works should be preceded by a process of technical development work (including the identification of appropriate designs), institutional change, training and capacity building. Thus, in a broad sense, the labour intensity of the construction industry should be increased incrementally, while the capacity of the industry to build more and more types of public works using cost-effective labour-intensive techniques is developed.

An incremental approach to increasing labour intensity may also be taken within each type of public works. For example, the construction process for surfaced roads may be broken down into many individual construction activities (for example, excavating earth, loading earth, and spreading earth). The financial and economic feasibility of labour-intensive construction depends partly on the labour productivity levels achieved. Labour productivity levels will be lower when the labour-intensive construction industry is in the early stages of its development (i.e. while training programmes and technical development work are in their early stages) than when it has reached maturity.

Thus, labour-intensive techniques would be financially or economically feasible (relative to machine intensive techniques) for fewer activities when the industry is in its infancy than when it has reached maturity. Similarly, labour-intensive techniques would meet the required quality standards in fewer activities when the industry is in its infancy than when the industry is mature. Thus, labour intensity should also increase incrementally in a narrower sense, that is within each type of public works, as the capacity of the industry to obtain higher labour productivity levels and quality standards in individual construction activities is developed.

The focus and aims of the cost calculations in COTA

Cost calculations, in which the cost of labour-intensive construction methods are compared to the cost of conventional machine intensive methods, form one element of COTA. It should be noted that there is a great deal of variation between the values of tenders for conventional machine-intensive projects, and hence it is difficult to determine "average" machine intensive costs.

The difficulty of ascertaining "average" machine intensive costs is compounded by the existence of multiple design alternatives for machine intensive construction. For example, both concrete roads and crushed stone roads are appropriate for machine-intensive construction. However, the costs (both initial construction costs and maintenance costs) of concrete roads and crushed stone roads differ.

There are also usually multiple design alternatives for labour-intensive construction. For example, interlocking concrete blocks, natural gravel, and waterbound macadam are all appropriate road base course materials for labour-intensive construction. Thus, there is not a unique cost of machine-intensive construction against which a unique cost of labour-intensive construction can be compared. The cost calculations are therefore potentially highly complex. The authors consider that empirical testing of COTA should be carried in order to find solutions to this complexity problem.

The cost calculations in COTA can be made purely on the basis of financial costs, or they can include adjustments for "market distortions". However, in the authors' view, policy makers should aim to develop labour-intensive construction techniques such that, where possible, they become financially cheaper than machine-intensive construction techniques.
The cost calculations in COTA differ to those carried out in conventional cost benefit analysis (CBA). Whereas CBA attempts to compare the relative costs and benefits of diverse projects, the cost calculations in COTA are confined to the narrower question of the relative costs and benefits of using different sets of machine-labour combinations in a particular project. Thus, in contrast to CBA, COTA compares alternative choices of productive technique and does not attempt to analyse the whole economy.

We are not arguing that no attempt should be made to assess the relative costs and benefits of making different investments, for example of building a road in one area rather than another area. However, as far as the question of the choice of technique is concerned, it may be assumed that a decision regarding the choice of investment has been made prior to the analysis. This is a plausible assumption where departments and thus budgets and planning are segmented.

**The treatment of costs, cost adjustments, and productivities as variables**

Although the cost calculations in COTA and CBA use similar staged approaches to the analysis of costs and benefits, the method of quantifying costs and benefits in COTA differs from that used in CBA. There is profound disagreement among economists about the appropriate manner to quantify social and economic costs and benefits. The quantification problem has led to many alternative measures, and no absolute or "correct" measurement may be identified. In addition, quantification is only as good as the data on which it relies. Data in South Africa is not only unreliable, but is often unavailable (this is a common problem in developing countries).

The cost calculations in COTA are based on the idea that quantification of socio-economic costs and benefits is inherently subjective, based on excessive aggregation, and biased towards market prices. The authors consider that an emphasis on quantification results in financial questions being falsely prioritised over technical, institutional, political and social issues.

Hence prices, benefits, cost adjustments and productivities are all treated as variables in COTA, rather than as entities with fixed values. For example, quantification of the social benefits of decreasing unemployment is dependent on subjective perceptions of the importance of the unemployment problem. In COTA quantification of these social benefits is made on the basis of the policy priorities of government and on the basis of empirical evidence from monitoring and evaluation, rather than on the basis of the analyst's personal perception of the importance of the unemployment problem. By making the quantification of economic and social costs and benefits explicitly dependent on the priorities of government (which is usually the "client" in public works projects), the authors hope to move away from arbitrary decision making regarding the limits to the socio-economic feasibility of using labour rather than machines in construction.

Sensitivity and scenario analyses can be used in COTA to highlight the effects of changes in values of variables on the outcome of the cost analysis. This enables the analyst to determine the relative importance of the various factors affecting the costs of different techniques. For example, the sensitivity and scenario analyses may indicate that, for given ranges of the variables, labour productivity is the most important factor affecting the relative costs of labour intensive techniques and machine-intensive techniques for a particular construction activity. This information can be used to inform policy makers that institutional changes (such as the introduction of an improved supervisor training programme), which would result in higher labour productivity levels, are required in order to increase the feasibility of
labour-intensive techniques.

A process of monitoring and evaluation is incorporated into the decision making process in COTA. This allows for learning by doing and incremental change. For example, monitoring of projects over time would pick up changes in labour productivity levels, which would result in changes to the values given to variables, which in turn would result in changes to the outcome of cost analyses.

**Who should use COTA**

COTA is a tool to assist government and other funding bodies in managing the process of increasing labour intensity in public works. In other words, COTA allows decision makers in government to reach systematic and consistent decisions, in accordance with their policy priorities, regarding the desirable degree of labour intensity of construction techniques. In addition it can provide useful information to aid the planning of a process of incrementally increasing labour intensity in public works (for example, through the use of sensitivity and scenario analyses).

Decision-making regarding the desirable degree of labour intensity of construction techniques is complex. For example, three factors which complicate cost comparisons between labour intensive and machine-intensive construction were mentioned earlier, i.e. the fact that different structural designs are appropriate for different construction techniques, the existence of multiple design alternatives for both labour-intensive and machine-intensive construction, and the large variation in the values of tenders for conventional machine-intensive construction.

In addition, thorough cost comparisons should involve comparisons of life cycle costs (including initial construction costs, maintenance costs and salvage values), as opposed to comparisons of initial construction costs only. However, different structural designs have different maintenance requirements and different salvage values.

For some projects, life-cycle cost comparisons involving all the possible design alternatives would be so complex as to render COTA unworkable in practice. The authors do not wish to create a large bureaucracy engaged in endless choice of technique analyses. However, empirical testing of COTA could throw light on possible ways of getting around the complexity problem.

For example, individual construction activities (such as excavation) could be analysed, as opposed to analysing entire construction projects. At a particular stage in the development of the labour-intensive construction industry in a particular province, certain average labour productivity levels may be achieved for excavation, depending on the hardness of the material to be excavated. Cost comparisons with machine-intensive techniques of excavation would give an indication of the socio-economic limits to the use of labour in excavation. Specific combinations of machines and labour could then be specified for various levels of hardness of material for projects involving excavation.

Care should be taken that the specification of the degree of labour intensity does not result in stifling of innovation in the construction industry. In this regard, it would be preferable to specify the construction activities in which machines should not be used, than to specify the kinds of labour-intensive techniques which should be used. For example, it could be specified that machines should not be used for excavation in material which is soft enough for hand excavation, and the industry would then be encouraged to develop innovative methods of hand excavation. For harder material, it could be specified that machines may be used for ripping before hand excavation. For very hard material, it could be specified that
machines may be used for excavation.

The line function departments (at national and regional levels, and local governments) could therefore use COTA as a decision-making tool regarding the degree of labour intensity to be specified for projects (or sets of projects) in specific geographical or political regions at particular stages in the development of an efficient labour-intensive construction industry. In this respect, monitoring and evaluation are important in order to keep track of the state of development of the labour-intensive construction industry in different areas of the country. Monitoring and evaluation are also important in other respects, and these are discussed below.

**The importance of monitoring and evaluation**

COTA determines the limits of the technical and socio-economic feasibility of using labour rather than machines in construction. This analysis on its own is inadequate, and must be supplemented by monitoring and evaluation to inform future planning and implementation. The results and recommendations from ex-ante and ex-post (after the investment) research, including, for example, recommendations regarding the improvement of training programmes, must be implemented. In other words, monitoring and evaluation must result in institutional changes if the labour-intensive construction industry is to mature.

**A schematic representation of COTA**

**Introduction to the schematic**

A schematic representation of COTA is given in the overleaf. According to the schematic, COTA is divided into three parts. The first part (P1) covers the part of the decision-making process which involves determining the technical limits to using labour rather than machines for individual construction activities.

The second part (P2) covers the part of the decision-making process which involves making cost comparisons. The third part (P3) covers the part of the decision making process which involves monitoring and evaluation, or in other words, the feedback mechanism.

**Discussion and elaboration of the schematic**

The reference numbers below refer to those shown in the schematic.

**PART 1 (P1)**

**Design for labour intensive construction and determination of the technical limits to using labour-intensive techniques for individual construction activities**

The first part of the schematic (P1) represents a technical screening mechanism, which involves determining the technical limits to using labour-intensive techniques for individual construction activities. Over time the range of technically feasible labour-intensive construction would increase in response to technical development work, training, and institutional capacity building.

**(P1) 1.1: Appropriate designs**

Attempts to make designs which were produced with machine-intensive construction in mind more
labour-intensive will often result in costly and poor quality products. If no appropriate labour-intensive designs are available, technical research is required to develop them.

(P1) 1.2: The technical feasibility of using labour-intensive techniques

The construction process should be broken down into distinct activities (such as excavate earth, load earth, haul earth, spread earth, and compact earth). The remainder of the first part of COTA involves a process of determining where machines are technically non-essential. For example, it is not possible to compact earth to the required density for roads using hand-tools, and hence machines must be used for this activity. Where there is disagreement among engineers about whether it is physically possible to use labour-intensive techniques for a particular activity, technical research should be carried out in order to resolve the issue.

(P1) 1.3: Standards: quality and construction time constraints

COTA is based on the assumption that all the technically feasible machine-labour combinations resulting from the choice of technique analysis would result in the same quality of product. In stage 1.3 of COTA, an assessment is made of whether labour-intensive construction techniques will meet the required quality standards for a particular construction activity. If the assessment indicates that labour-intensive construction techniques will not meet the required quality standards for that construction activity, then more machine-intensive techniques should be used for the activity.

The technical limits to using labour rather than machines are partly based on quality and construction time constraints. Quality and time constraints should be checked to see if they are appropriate for the project being analysed. If the constraints are binding and labour-intensive techniques cannot be developed such that they would meet the required standards in the time available before the project starts, then machine-intensive techniques should be used for the activity in question.

(P1) 1.3.1: Quality

As mentioned above, if it is not possible to achieve the required quality standards using labour for a particular activity, then machines, or a combination of labour and machines, should be used. However, existing labour-intensive techniques can be developed and improved. Hence it may be possible to develop improved labour-intensive techniques which can meet the required quality standards before the project commences.

(P1) 1.3.2: Time

COTA is based on the notion that labour-intensive construction should not result in unreasonable cost sacrifices. Long construction times may have significant cost implications. If the use of labour-intensive techniques would result in delays which would have significant and unacceptable cost implications, then machines or a combination of labour and machines should be used. Again, the speed of labour-intensive construction can be improved, for example, by improving labour productivity, by improving the training of supervisors, or by increasing the number of labourers on site.

(P1) 1.4: Results of the technical screening process

The technical screening process identifies those activities for which it is technically feasible to use labour-intensive techniques, and those activities for which machines, or a combination of labour and machines, must be used. Thus the result of the technical screening process is the most labour-intensive
PART 2 (P2):

Determining the limits to using labour-intensive techniques on the grounds of financial, economic, and social cost

In Part 2 the financial and socio-economic (and political) feasibility of the set of construction techniques produced as the outcome of Part 1 are assessed.

(P2) 2.1: Cost calculations

At this stage (P2) the construction process is examined as a whole, rather than as separate construction activities. The direct construction cost 4 of the most labour-intensive set of construction techniques which is technically feasible (the result of the technical screening process) is compared to the direct construction cost of conventional machine-intensive construction. In addition, economic, social, and political costs and benefits may be calculated 5.
2. Urban development

2.1 To what extent can NMT interventions be implemented using labour-based technologies and methods?

Prof. T. Rwebangira, Department of Civil Engineering, University of Dar es Salaam

Introduction

Reason for a mobility and non-motorised transport (NMT) action plan

Urban areas in Tanzania are growing rapidly due to a combination of factors. These include the unequal distribution of services, resource degradation and high population growth in rural areas, which cause people to migrate to cities, and population growth within the cities themselves. This rapid growth combined with inadequate resources overall means that social services are severely constrained. Amongst these services is transportation. Current estimates for the city of Dar es Salaam show that motorised transport is providing for less than 50 per cent of the daily trips of the residents. The average mobility of middle and low income households is estimated at 1.96 trips per person per day. It is not possible to increase the modal share of motorised transport due to serious resource constraints among which are capital, land availability and unaffordability of motorised vehicles by the majority of residents. On the other hand, it is very important that the level of mobility of the majority of residents be increased so that they can participate in wide ranging economic activities. Hence the need to plan for non-motorised transport so that it can play its role in the total transportation system.

Role of NMT studies and the Sub-Saharan Africa Transport Policy Programme (SSATP)

The SSATP is a broad based programme to improve transport efficiency and sustainability through policy reform. The programme is funded by donor agencies and supervised by the World Bank and the Economic Commission for Africa. The studies on NMT have been sponsored under this programme specifically to address issues related to greater and safer use of non-motorised transport modes in Africa's urban areas. The studies address all factors that constrain mobility in general and those that inhibit the use of non-motorised modes in particular. A review of urban transport policies in Dar es Salaam as well as regulations and institutional arrangements that have an effect on the development of non-motorised transport modes have also been carried out.

NMT studies in Tanzania

The NMT study in Tanzania was concentrated mainly in Dar es Salaam, although a quick survey of several upcountry towns was made in the initial assessment phase of the study. The study consisted of three main parts. The first part was concerned with the assessment of existing urban transport situation and user views. Data on the existing situation was obtained from past and ongoing studies as well as interviews with relevant officials. The users views were collected through "focus group" discussions involving a cross-section of Dar es Salaam adult residents including secondary school students.

The second part of the study consisted of a workshop which brought together users, providers and professionals working in the urban transport sector. The result of the workshop was to highlight key
constraints to mobility that needed further research. The workshop also made recommendations on possible projects that can enhance the use of NMT. After the workshop two members of the study team visited India, Thailand and China to observe the role of non-motorised transport in urban areas.

The third part of the study was the design and execution of a household survey of a typical middle-low income residential district in Dar es Salaam and a corridor survey. The main purpose was to understand in more detail the travel behaviour of the residents and their mobility constraints.

Study findings

The study results point out the following constraints to mobility for the majority of Dar es Salaam residents.

Unaffordability of transport costs

From the Household survey results the average mobility for the survey population was found to be 1.96 trips per person per day. This value is very low and indicates that a lot of people are immobilised around their homes. Those going to work at fixed workplaces were found to make only one round trip per day and a large number walked to their destination. For the most important trip of the day 45 per cent of respondents walked all the way while 44 per cent used the bus. Considering trip length, it was found that 57 per cent of all trips were less than 3 km showing the limited range of the pedestrian trip. One of the major reasons for this low mobility is that a large number of the residents of Dar es Salaam cannot afford the bus fare of about Tanzanian shillings 70/= per single trip, irrespective of length.

Cycling can provide movement within the residential districts and cater for most non-work trips as well as work trips if the workplace is located within a reasonable distance. But most residents cannot afford a bicycle which on the average costs about four times the monthly minimum wage.

Traffic conditions

The survey results indicate that the existing traffic conditions in Dar es Salaam have an overall negative effect on mobility. Fear of road accidents has made it difficult for one to use a bicycle on a trip downtown. This can be attributed partly to the fairly high speeds of motorised traffic in some areas and partly to poor driving behaviour especially of Daladala drivers. The same reasons have curtailed walking along the major corridors especially because of the difficulties and danger associated with crossing the road between intersections. Safety is the most important reason not to cycle on the main corridors or to consider cycling as a potential mode for such a trip.

Lack of infrastructure

The assessment of the users as to the quality of the route infrastructure indicate that most consider the condition of the road surface a hindrance to either walking or cycling. More serious in this regard is the absence of a continuous direct route for cycling or walking in many areas of Dar es Salaam. Another serious obstacle to walking and cycling is the obstruction of the few existing pedestrian and cycle lanes by parked cars or kiosks.

Perception and attitudes

The behaviour observed among the study population towards NMT is a product of their perception of this form of mobility and the attitude formation that result from it. There are certain perceptions about public
transport that favour the use of NMT and these include:

- harassment in the Daladala type of buses.
- potential for accidents of the Daladala bus.
- the unreliability of the bus schedule.

On the other hand a number of perceptions exist which have contributed to a negative attitude towards NMT, they include:

- increased accident potential in mixed traffic.
- low action radius of cycling.

**Interventions planned**

**A strategy for improving mobility**

In order to improve the economic situation of the majority of Dar es Salaam residents, their mobility must be increased so as to enable them to undertake various income generating activities. The strategy that has been adopted has the following components:

- provision of public transport by both private and public companies on all major arterial and collector routes.
- movement inside residential districts to be provided by non-motorised transport mainly walking and cycling.
- walking and cycling to be the main mode for accessing public transport.
- restriction of the private car in the Central Business District and provision of priority bus lanes.

Based on the existing situation in Dar es Salaam, this strategy seems the most practical. This is because this strategy would in effect be improving on existing conditions. At the moment 50 per cent of the trips are made by walking all the way to the destination and if the walk to the transit stop is included it can be seen that walking accounts for a large portion of the trips made.

The logical improvement of the situation, is to reduce the walking journey time by improving the network quality and by upgrading the mode from walking to cycling. Walking is the backbone of mobility of the residents especially since public transport trips include a relatively long walking component.

Cycling could raise the action radius of a large low income population segment from less than 3 km to 6-8 kms. Cycling is three times faster than walking and three times cheaper than an efficient bus, and equally fast (door-to-door) for up to 45 minute trips. People currently using public transport could switch to cycling if their liquidity problem were solved.

**Priority interventions**

Given the constraints to mobility and the strategy that has been adopted, it is important to look at a set of interventions that can be adopted immediately. The selection of the interventions will be based on the criteria shown in table below:

Table 1: Prioritisation criteria.
1. Does the intervention address current user priorities?
2. Does the intervention address current administrative priorities?
3. Can it be monitored and its success evaluated?
4. Is the technology for implementation available and affordable?
5. Is the intervention cost-effective?

The interventions listed in the table below can be adopted immediately based on the above prioritisation.

**Table 2: Priority interventions.**

<table>
<thead>
<tr>
<th>Constraint</th>
<th>Intervention</th>
</tr>
</thead>
</table>
| **A. Unsafe Traffic Conditions**  
- fear of walking or cycling due to possible road accidents | **A. Traffic management**  
(1) traffic calming: reduce motorised traffic speed to 40/50 km/hr using proper design standards  
(2) provide safe pedestrian, cyclist and carts crossing  
(3) provide separate pedestrian and cycle lanes  
(4) enforce traffic rules and behaviour in mixed traffic conditions |
| **B. Inadequate or poor route quality**  
- the conditions of the pedestrian/cyclist lanes is a hindrance to mobility. The surface is very poor, the route discontinuous with too many detours | **B. Route infrastructure improvement**  
(5) spot improvement of pavement structure for both motorised and pedestrian/cycle traffic  
(6) construct new links to improve route connectivity  
(7) Eliminate sidewalk parking and petty trading structures  
(8) Improve layout and location of bus stations and provide bicycle parking facilities |
| **C. Unaffordability of transport**  
- inability to purchase a bicycle  
- cannot afford bus fare | **C. Improve Affordability**  
(9) eliminate taxes and import duties on bicycles and bicycle parts  
(10) introduce credit purchase scheme by employers and other groups |

**Infrastructural Interventions and Construction Activities**
The proposed interventions will be implemented through a proposed pilot project during the 2nd phase of the NMT study. The approach of the implementation phase will be to try and work within the existing institutional framework so as to facilitate linkages between local government and NGOs. In the pilot areas, the first step will be to try and organise community participation in the planning and execution of the interventions. In addition efforts will be made to try and bring together various stakeholders including residents, professionals, police and others in planning the implementation of the various interventions.

In the implementation of infrastructure interventions it is proposed to use labour-based technologies and methods. In this regard external assistance will be sought. Below is a brief description of the proposed interventions where labour-based methods will be applied.

**Traffic calming**

(a) **Problem:** Due to the ineffectiveness of posted speed limits and the inadequacy of police control, it is suggested to use self enforcing physical measures wherever possible. Care should be taken to ensure that the speed limits are consistent with the nature and type of road.

(b) **Proposed measures:**

Road humps: A series of road humps increasing in height from 40 mm to 100 mm in height can be used gradually to slow down traffic in areas where cyclist/pedestrians predominate. The concept of road humps to reduce motorised traffic speed in Dar es Salaam is acceptable. However, their design and construction is often very poor resulting in their becoming ineffective or dangerous. In many cases they are too short and sharp and drivers at the risk of damaging their suspension system can drive over them, at high speeds.

Road narrowing: This concept can be used to induce lower speeds as traffic passes through residential neighbourhoods. The measure has not been extensively used in Dar es Salaam, but can be used to control speed.

(c) **Major construction activities:** A typical design of road hump is shown in Figure 1 and that of road narrowing in Figure 2. It can be seen that the design is such that it can be constructed using labour-based methods. The construction activities involved include

- excavation of the 500 mm width toe.
- cleaning and levelling of the base.
- manufacturing and erection of form work.
- placing and compaction of bituminous or concrete mix.

All these activities currently are being performed using labour-based activities on most construction projects in Tanzania.

**Pedestrian crossing**

(a) **Problem:** Crossing at intersections can be particularly hazardous, additionally in Dar es Salaam heavy crossing demand occurs away from intersections on most arterials where vehicle speeds are high. Poor judgement of approach speeds combined with the presence of obstructions such as parked vehicles have tended to increase the frequency of accidents at such locations. The provision of underpasses or overpasses have so far been deemed too expensive for implementation.
**Proposed measures:** At intersection the simplest and cheapest method is a central refuge which allows pedestrians and cyclist to negotiate one traffic stream at a time. Central refuges should consist of physical islands incorporating bollards and lit by existing street lighting or supplementary floodlighting. The minimum width should be 1.8 m and for cyclist should be ramped to the street surface.

**Construction activities:** Construction of a central refuge can be undertaken using labour-based construction method. The construction activities involved include:
- excavation.
- concreting.
- blockwalling.
- back filling.
- compaction.

**Separate pedestrian and cycle lanes**

**Problem:** Like pedestrian, non-motorised vehicles are amongst the most vulnerable groups of road users as they are unprotected when in a mixed traffic flow situation. Consequently, any impact, even a small one, can result in serious injury to riders and passengers. On the other hand the presence of slow moving vehicles on the same carriageway creates hazardous working conditions as other vehicles are forced to slow down suddenly or tempted to overtake. Finally this lack of security and to a lesser extent, comfort has led to the fear of using bicycles in Dar es Salaam.

**Proposed measures:** Different types of traffic need different facilities and NMT user should be segregated wherever possible from faster motorised vehicles.
- provide for separate lane for cyclist if possible as part of a network. Cycle lane should have a minimum of 2 m to allow two cyclist to ride abreast. Wider lanes are necessary to accommodate pedestrians. A narrow separation without a difference in level to the carriageway, offers little protection to cyclist. Therefore a dividing verge must be provided which can physically separate the cyclist from motorised traffic as such a concrete kerb of height 30 cm is proposed. The maximum width of a cycle lane should be 2.50 m, a wider lane looks like a collector road and can be used by motorised traffic.
- provide a separate lane for pedestrians where their volume justify.

**Construction activities include:**
- excavation.
- hauling.
- material placing.
- compaction.
- concreting.

**Spot improvement of route infrastructure**

**Problem:** Currently the majority of NMT users view the routes they use as being difficult. This difficulty is associated with the current condition of the routes which include among other things:
- broken surfaces with potholes and standing water.
routes not being direct.

● obstruction on the routes.

● lack of road markings and signs.

(b) Proposed measures: Potholes that can unbalance two wheeled vehicles and cause cars to swerve suddenly must not be allowed to develop. Timely routine maintenance will take care of this problem. Attention should be paid to cross slopes when designing as well as when grading the road or lane so as to make sure that water flows away.

Drainage ditches must remain free of obstructions and retain their intended cross-sections and grades. Surface water should be able to drain away from the road.

Natural obstacles like sand or boulders should be quickly removed from the lanes.

Signs, marking and reflectors and other traffic control devices should be kept clear and visible.

(c) Construction activities:

● preparation of cold mix asphalt.

● asphalt priming.

● excavation of damaged section.

● filling potholes.

● compaction.

● clearing of sand and gravel.

Construction of new network links

(a) Problem: The NMT network in Dar es Salaam is discontinuous and has a lot of detours. Walking and cycling because of their sensitivity to travel time require a route that is direct. In addition the network should be comfortable and attractive.

(b) Proposed measure: The immediate solution is to construct the missing links so that some important routes are continuous from the major origin to destination.

(c) Construction activities involved: This intervention calls for very basic construction activities such as;

● excavation.

● levelling.

● hauling of materials.

● compaction.

● concreting, etc.

The Way Ahead

Potential for labour-based technologies

The majority of urban areas in Tanzania are characterised by high unemployment and low incomes. The
adoption of labour-based technologies and methods in implementing infrastructure projects will therefore lead to a number of socio-economic advantages. With regard to the Dar es Salaam pilot project areas the following advantages are foreseen:

**Employment opportunities:** The study findings indicate that the unemployment rate in the study area is about 20 per cent, in addition there is a significant number of self-employed people in activities that only occupy about 30-50 percent of their time. As such the use of labour-intensive approaches in the implementation of infrastructural projects will result in employment opportunities for the people in the area.

**Increased incomes:** A large portion of the adult population of the pilot area earn no income at all. This group include the unemployed as well as housewives and students. The use of labour in the implementation of infrastructure projects will result in increased income for the unemployed and women.

**Project sustainability:** Since labour-intensive projects use relatively simple technologies, it will be relatively easy for people to acquire the necessary skills. These will enable them to repair and maintain the infrastructure when necessary. As a result the community will become self-reliant and the sustainability of the project as far as maintenance is concerned will be assured.

**Problems to be overcome**

In order to use labour-based technologies in the implementation of infrastructural projects, certain technical issues will have to be addressed. In the initial stages of implementation assistance will be sought to deal with the following:

**Quality of output:** There is need to guarantee that the quality of the constructed project is consistent with the standards that currently exist. The pilot project will need to develop appropriate planning, programming and control systems to make this possible. It is envisaged to train supervisory staff on site in how to effectively supervise the labour and make available adequate hand tools and light equipment.

**Quantity of output:** In some of the interventions such as the construction of pedestrian and cycle paths, the output requirement is considerable. The project staff will have to be trained in how to effectively organise, motivate and select quality tools so as to achieve a reasonable level of output.

**Project costs:** In the planning for the implementation of the interventions using labour-based technologies, it was assumed that these will result in lower project costs compared to conventional methods. Currently it is possible to pay wages of USD 1 per day on construction sites in the area. However, there is still need to demonstrate whether these lower wages results in lower project costs when everything is considered.
2.2 Alternative strategies for the provision of infrastructure in urban unplanned settlement areas: Are these strategies effective and how can they be supported and developed?

J. Tournée, ILO Consultant and J. Omwanza, ILO/ASIST

Problems

Infrastructure services in many urban centres are in a serious need of attention. The little services that there are, are usually concentrated in high income areas which are sparsely populated!. Taking Nairobi as an example: Many of the roads are in a poor state of repair, and some have fallen into a state of complete disrepair. The majority of high population low income "informal settlement" residential areas are not served with a formal road network (Mathare, Kibera, Kawangware, Korogocho, to name just a few). Drainage which poses an immediate health hazard to the inhabitants in these areas is even worse. Most of the informal settlement are in areas with poor natural drainage and are prone to flooding. Solid waste collection and disposal is practically non-existent in these areas.

A few reasons leading to the failure in the provision of these services are:

Inappropriate urban by-laws

The laws that govern the provision of services are too stringent and do not give room for different alternatives. It is interesting to note the origins of the Nairobi by-laws. They were just picked from Blackburn (a town in Britain), and used unaltered except for the name which changed from Blackburn to Nairobi!

The methods employed in meeting these stringent conditions are also restrictive. For example, to tender for a job of constructing a sewerage line, one is required to prove the availability of very expensive equipment whereas what may be needed is a set of hand tools and the people to use them.

Inappropriate (incomplete) training

The institutions of learning, which educate the people charged with the responsibility of providing the services are all geared to the use of only one form of technology. They are all trained to think of heavy equipment without critically looking at other alternatives. It is desirable to have engineers, architects and all other people, charged with providing infrastructure services, especially in urban areas, to have a sense of technology choice imparted into them from the early years of their career.

Resources

The traditional design of services calls for high levels of inputs in terms of materials and equipment which are not easily affordable by under-financed municipal councils.

Planning

This is another area which needs serious attention. Many urban centres started as unplanned settlement areas. Even where plans were made for recognised urban centres either population growth was not given
adequate consideration, or accurate forecasts were not available. The large increase in rural-urban migration in search of employment coupled with population growth has overstrained the available services resulting in rapid deterioration of existing services and non-provision of new services. This unforeseen situation has led to the growth of so called "informal settlements" in many urban centres in developing countries.

Lack of consultation with the users of the facilities to assess their needs is an important aspect which has not been considered in the past.

**Initiatives to find alternative solutions to the problems**

**The use of community participation in the planning and execution of infrastructure improvements - an outline of the approach used in Colombo, Sri Lanka**

Colombo was one of the first cities to formally encourage the involvement of communities in the provision of facilities and improvements to their immediate environment. The National Housing Development Authority (NHDA) assisted by UNCHS (HABITAT) developed the Community Action Planning (CAP) approach which focused on involving the communities in the planning and execution of infrastructure improvements.

The principles of CAP are as follows: A series of workshops for the community, a specific group of people in a defined geographical area, are held to discuss their most pressing infrastructural and environmental needs. Once these have been identified, the community forms a Community Development Council (CDC) to represent them. The CDC must be registered, with a legal standing, and open and operate a bank account. The first infrastructural improvement is identified and designed in collaboration with the CDC.

A contract is set up between the CDC and the responsible authority for the construction of this improvement (such as a re-designed well and washing facilities). Technical support for the design of improvement works and for the preparation and interpretation of contracts is available either from the NHDA, the city council, or can be privately hired by the community. The NHDA or funding authority then pay the CDC the cost for materials and labour for the first contract and leave the community to organise the work through the CDC. If the CDC is weak in management skills they can be supported by an NGO through which the funds are channelled.

Included in the contract sum is an allowance for a modest profit such as a small contractor would make. This profit is paid to the community with the other moneys and can be used for further improvements to the area or for assisting groups within the community who may wish to start other projects such as income generating activities.

The CAP approach was instituted as a direct result of the poor quality of services provided by contractors, lack of maintenance of services and unsuitable designs.

Projects can be implemented with different levels of community participation. The community can be used to execute works for which they have had no input into the decisions of what to construct and how to construct it. This is not proper participation. Alternatively they can be involved in identifying the problems, defining and implementing the solution as was the case in the projects discussed in the section case studies starting at page 113.
The community can provide some element of unpaid labour for the execution of the works thus reducing costs and freeing the available funding for further improvements. However, the sole use of unpaid labour can only work well for short term projects. The project should be completed or at least start functioning while enthusiasm in the community remains high. Therefore it is not recommended for major works in settlement upgrading.

**Designs and methods of construction for community-based urban upgrading**

In the PUSH, Kalerwe and Hanna Nassif projects, which will be introduced below, the designs and construction techniques used for the urban infrastructure works are adaptations of standards and practices established in the rural road sector. However, there are major differences in operating within an urban area and within a rural area.

If we consider road and drainage construction, the road width and alignment in an urban unplanned settlement is determined by the space between existing buildings with an effort to keep demolition to an absolute minimum. However, the difference in the approach to drainage is more radical.

- The use of mitre or turn out drains is rarely possible due to densely packed housing.
- Often unplanned settlements are in low lying areas or areas with drainage difficulties, therefore an accurate survey and assessment of the design is needed for each proposed drain before the start of the project. There may be a need for a more rigorous pre-project planning phase than is allowed at present in the preparation of a project proposal.
- In many cases the provision of standard details alone is sufficient for construction and improvement of rural roads by a well trained foreman. However, in the urban situation this is often inadequate unless a qualified engineer is on site to make small adjustments to the standard details as is required.
- In urban areas there are few possibilities of getting rid of storm water. The drainage system must continually gather run-off and carry it to a suitable outfall point or existing drainage system. As a result drains must be set at accurate levels and the size of the drains will increase to larger and deeper sections than is normal for roadside ditches on rural roads.
- There are more obstacles in the path of the construction work in urban areas than in rural areas, even in unplanned settlements i.e. electric cables, telephone poles, water supply pipes and domestic connections. These obstacles may result in the need for alterations to the design during the construction phase.
- The design will also be affected by the future maintenance arrangements. Who will be responsible - the community, the municipal council? If the community are to be responsible for the maintenance, then the design must assure ease of access to drainage for maintenance purposes. Even if the municipal council is to be responsible for the maintenance, it is necessary to assess their capacity to carry out certain kinds of maintenance activity. Will they be able to clear long lines of drainage pipes, or will it be more practical to have open drains which can be desilted by a gang of workers with simple tools.

The above points may seem obvious to a municipal engineer, but they are significant in the transfer of technologies and methods of working from the rural setting to the urban setting.

**Employment generation in urban works programmes through efficient use of local resources**
A project bearing the above title was set up by UNDP and ILO to assist governments of Least Developed Countries in exploring ways to alleviate urban unemployment and poverty through the mobilisation of their natural and human resources for employment, when properly adapted to local conditions. With the emphasis on the use of local resources and employment generation, the project focused on encouraging the use of labour-based methods and appropriate technologies in conjunction with community participation to improve urban infrastructure.

Proposals for pilot projects, one in Dar es Salaam - Hanna Nassif, and one in Kampala - Kalerwe, were two of the results of the Employment Generation Project.

**Case studies of three projects - Push, Kalerwe and Hanna Nassif Pilot Projects**

**Project Urban Self-Help (PUSH)**

**Project background**

Zambia has one of the highest, if not the highest, urban population in Africa expressed as a percentage of total population. In 1988 the figure was well over fifty per cent. Seventy per cent of Zambians do not earn formal salaries and cannot afford even the lowest cost houses. Therefore, unplanned settlements have mushroomed around Lusaka and other major towns. The Second National Development Plan of the Government of Zambia recognised that although squatter settlements were unplanned they nevertheless represent assets in social and financial terms. Due to a lack of resources, the problems faced by the communities in the squatter areas could not be tackled by the municipal councils. Drainage, disposal of solid waste, and sanitation were identified as priority concerns of the communities.

The structural adjustment programme resulted in a dramatic rise in the cost of living. Those people most affected by the increase in prices were the urban poor. The World Food Programme (WFP) in Zambia prepared a quick action project to give food support to them. The work entailed the construction of storm water drains, access roads and footpaths, improvements to the water supply, sanitation and refuse removal.

The aim of PUSH was to offer opportunity for 3,000 workers (in the Lusaka area) to work and receive food rations for a family of five. Many of the head of households in the squatter areas were women and as the women in all households have responsibility for feeding the family, 98 per cent of the participants in the project were women.

Technically the project was supported by 3 UNV civil engineers and a part-time consultant from HABITAT. In addition ILO was approached to run training programmes on road and drainage construction for the engineers, technicians and community leaders. The municipal councils provided counterparts to the technical team and additional field workers in the health and community participation fields. In each compound (unplanned settlement area) an NGO was responsible for the execution of the project under the guidance of the main NGO, Human Settlements of Zambia (HUZA), and the WFP.

The project once started in Lusaka was then extended to Ndola and other "Copperbelt Towns". The results have been very positive in demonstrating what can be achieved when self-help efforts are properly directed technically and support given for the organisation. The title suggests that the work would be carried out on a self-help basis. In fact most works were paid for using food rations, however at week-ends some of the men from the compounds came forward to do excavation on a self-help basis
and training was carried out for self-help maintenance.

**Technical aspects**

Using mostly standard details devised for rural roads and roadside drainage it was necessary to adapt them to suit the new environment. With a policy of minimum or nil demolition of property, the designs had to be flexible to site conditions.

Unlike some of the unplanned settlement areas in other countries, in Zambia most of the main accesses which had been laid out were still free from buildings and roads up to 5.5 m carriageway width were possible with drains on either side. In some of the narrower side roads it was necessary to design 3.5 m carriageways in cross-fall with one side drain. Due to the relatively good soil conditions in most of the compounds the drains were unlined, with some stone pitching in particular problem areas.

The project had been designed assuming outputs comparable with reasonably run rural road construction sites. In practice there were several reasons why the targets were not reasonable and why there was need for extra works. They are as follows:

- removal of refuse from the site which had been dumped over many years.
- the large number of vehicle crossings required across the side drains for entry in to business premises, churches, clinics, and private houses.
- the large number of pedestrian accesses needed across the side ditches and main drains.
- the need for larger cross-sections for the side ditches and main drains, as water cannot be taken away in mitre or turn out drains.
- the increase in the number of road junctions and thus in the provision of drifts and culverts.

For example one 225 m long road, needed 4 vehicle access drifts across the side ditches, 6 pedestrian accesses and one main drift or culvert at the junction with the main access road. This is a considerable increase on the rough estimate of 2 culverts per kilometre for a rural road.

The work was being "paid for" by food rations and all who came forward to work regardless of ability were employed. It was therefore difficult to achieve reasonable task rates. The women preferred working in groups. Due to an early start to employment when not all technical details were finalised they were used to being given small tasks for a large groups of workers.

Despite some difficulties, which are to be expected in adopting a new approach to urban upgrading, the achievements of the project are visible and have been very well received by communities, municipal councils and government alike. Recently traffic on a main route in Lusaka had to be temporarily diverted and many drivers found themselves on well constructed unpaved roads which had been improved under PUSH. The project started in 1991 and has been extended and is still carrying out improvements to unplanned settlement areas.

The use of community participation was central to the success of PUSH, but the community participation did not include the use of community contracts. All operational activities were controlled by the project staff.
2.3 Evaluating the benefits of implementing labour-based construction in an urban community

R.B. Watermeyer, Soderlund & Schutte Inc

Executive summary

Politicians, development organisations and communities in South Africa have come to realise that the building and construction industry can be used to provide employment and to empower specific or targeted communities. Various construction practices have emerged to address aspects of employment and empowerment. At the same time development support systems have 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. 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?

There is also a need to develop project evaluation criteria which may be used, in the first instance, to compare one technology or approach against another and thereafter one project against another using clearly defined statistics and a common approach to project evaluation.

Watermeyer et al (1994) 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 items before combining them in a formula to establish a Project Index:

- 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 Project Index (PI) 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. Accordingly, this index 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 certain projects. The Project Index can also be used to monitor and measure the change in spending pattern on projects as levels of spending on targeted labour increase.

Threshold values for specific programme and project objectives are proposed. Projects within Soweto's Contractor Development Programme are evaluated to illustrate the project evaluation process.

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 this 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 (Watermeyer and Band, 1994). Labour-based technologies have also being 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, e.g., 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 (Watermeyer and Band, 1994):

- Development Team Approach.
- Managing Contractor Approach.
- Main Contractor Approach.
- Contractor Team Approach.
- Mentorship Approach.
- Joint Venture Approach.

All these systems to a greater or lesser 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
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 (1994), 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 man-hours generated on the project as a whole is probably less than 250%. COSATU (1994), 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 Annex 1.

Evaluating projects

The approach

Watermeyer et al (1994) 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:

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- 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.

Employment opportunities

Employment opportunities should be assessed in the following manner:

1. Establish the cost of construction and the estimated total number of man-hours 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 man-hours 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.

The statistic generated in respect of 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 (1994) suggest that all costs should be escalated or de-escalated, as appropriate, to the base month of July 1994.

Watermeyer et al (1994) 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 (1994) 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/man-hour. 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/man-hour (Watermeyer et al, 1994). Thus projects which yield an average expenditure per unit of employment generated of less than 50% of that of the industry as a whole, may be classified as being labour-based.

**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, e.g. 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 i.e.. 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.

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 i.e., the construction cost retained by the community amounts to 12% (Watermeyer and Band 1994). 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% (Watermeyer et al., 1994).

**Project Index**

Watermeyer et al (1994) have established a Project Index (PI) to evaluate and compare projects against each other, viz.:

$$PI = \frac{20}{EEE} + 1.75\frac{PCR}{100} + \frac{ECC}{EPC}$$

where

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

and $ECC \leq 1.0$ ...(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. 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.

**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
- Marlborough Gardens (Sandton) pilot project (water & sewer) - 2.9
- Plumbing in Soweto's contractor development programme - 3.1

Project indices can change, particularly where projects attract cost premiums. In this regard, Watermeyer (1993) points out that labour-based construction practices will probably become more cost competitive since current cost comparisons with conventional construction practices have been undertaken in a
recessionary period where plant on most projects has been priced at unrealistically low levels.

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. 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:

\[
\text{Sum of ECC}.PP > \text{PRP} ....3)
\]

\[
\text{EPC}
\]

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.
2.4 Labour-intensive infrastructure development in the urban informal sector: ILO's strategies and programmes for urban poverty alleviation on an inter-regional level

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Introduction: urbanisation, unemployment and poverty

J. Tournée and J. Omwanza's paper presents an excellent analysis of case studies showing the need for, results of and difficulties associated with labour-intensive and community-based approaches for urban infrastructure development in unplanned settlements. Rather than repeat their analysis, I would like to present briefly what the ILO is doing and planning on a global scale in this field; and to suggest possible linkages with the ILO ASIST programme including the extension of its mandate to cover the urban sector. To begin, I would like to present some of the conceptual issues related to labour-intensive approaches in the urban sector.

Most of us know the history of ILO's association with employment-intensive infrastructure development programmes whether undertaken in the framework of the Labour-intensive Special Public Works Programmes, or the Construction Technology Programme. Throughout the 1980s these programmes targeted almost exclusively rural areas of least developed countries. In fact, one of the often-stated objectives of these programmes was to stem rural-urban migration. The premise was that labour-intensive infrastructure development would improve the productivity of rural agriculture and thereby support sustainable rural employment creation through injecting cash incomes and improving rural living conditions.

While I would not dispute the basic validity of this approach, labour-intensive rural infrastructure development programmes certainly have not been sufficient to slow down the pace of urbanisation. This paper makes no pretext at analysing the root causes of rural-urban migration in developing countries, nor the most appropriate policy responses. This has been a major theme of development literature over the past thirty years. Rather I would like to begin with a simple observation that urbanisation, and the urbanisation of poverty is a fact of life that will not go away. The ILO publication "From Want to Work," describes the situation as follows:

A persistent argument for not supporting urban improvement is to say that people should rather stay in the countryside. Unfortunately, it is too late. They have already moved to town.

In 1950, about 30 per cent of the world's population lived in urban areas. At present, only thirty-five years later, this figure has increased to 45 per cent, and in only ten years from now, it is estimated that the world will be 50 per cent urban. In much development literature, the urban population is seen to be relatively affluent with access to superior infrastructure and services, as well as to formal sector employment, and high wages. However, this situation is changing rapidly, and appears to be overtaken by the urbanisation of poverty.

In many African cities, urban drainage, road and housing infrastructure networks are serving populations far exceeding their original designs, and in many cases, no major improvements or extensions of these
networks have been undertaken over the past thirty years. The situation is even worse in the unplanned squatter settlements mushrooming on the outskirts of, and even within, planned settlements. Here even the most basic forms of infrastructure and services are virtually non-existent. Rather than measuring urban poverty in terms simply of incomes, lack of access to urban infrastructure appears to be both a cause and a symptom of urban poverty.

The past decade of structural adjustment programmes in Africa has been associated with sharp cutbacks in spending on urban infrastructure. Although these structural adjustment programmes have therefore had a generally negative effect on employment and living conditions for the urban poor, they have provided an additional impetus to explore the feasibility of labour-intensive and local resource-based approaches, this in a context where international assistance is increasingly rare and where efficient utilisation of local labour and resources therefore becomes a necessity.

Labour-intensive and community-based urban infrastructure development requires strategies which are specifically designed for the urban sector. Tournée and Omwanza have presented many of the engineering and technical constraints specific to unplanned settlements, including the requirement to adapt designs to house location in order to avoid demolition, the tricky question of drainage in low-lying and relatively level settlements, etc.

Techniques and forms of community participation are also different in urban areas, where urban populations are heterogeneous and therefore are less easily mobilised around themes of common interest. For example, urban residents may be mainly interested in evacuating flood water from their house's doorstep, even if this means channelling it on to the doorsteps of their neighbours. And as the Kalerwe drainage project in Uganda has shown us, urban drainage is often closely linked to the question of garbage disposal, sanitation, and accessibility.

Therefore urban infrastructure development is closely linked to other issues which both complicate policy and operational responses, but also provide new opportunities for integrated approaches to address urban poverty. I would like to highlight briefly some of these potential links, before discussing what the ILO, in partnership with other actors, is trying to do about them in operational terms.

**Community-based upgrading and land tenure**

One linkage is between community-based infrastructure development and land tenure issues. In an exploratory mission to the Philippines, the mission identified different types of land tenure situations confronting the urban poor. One type was classified as danger zones. These areas included squatters living along railroad tracks and canals, close to and even on top of mammoth garbage dumps, and even within the perimeter of an international airport. In such cases, clearly some form of relocation appears to be the only solution. Nevertheless, relocation often means separating the poor from their only source of income or employment, even if this means scavenging through garbage, and therefore relocation usually fails unless solutions are found to provide sustainable incomes to those being relocated.

Other land tenure situations, where squatters have no legal title, but over the years have acquired some semblance of right to occupy the land, begin to open the door to community-based approaches to upgrading of these settlements. Community involvement in improving its own living environment usually requires a certain amount of security in land tenure. Only then will the urban poor be convinced that their investment in time and scarce resources to improve their neighbourhood will not be destroyed by the bulldozers of urban planners and developers. Therefore land tenure security is an important issue...
to address at the planning stage of any labour-intensive and community-based upgrading programme. This question is often less important in rural areas where land is less scarce and where traditional land tenure systems usually ensure security for even the poorer segments of society. Also once previously neglected land is improved, property prices go up; and the poor run the risk of being forced out, or bought out, of neighbourhoods in which they have invested their resources to improve.

**Infrastructure development and the urban informal sector**

Another issue concerns the links between labour-intensive infrastructure development and the so-called urban informal sector. The ILO has decades of experience in research and action programmes relating to the urban informal sector. Some of this work involves small and micro-enterprise development. Such so-called "micro enterprises" rang from a women selling fried fish on a street corner, to a producer of cement blocks, to a motorbike mechanic operating on the street corner. Larger but still very small-scale enterprises involve carpenters working out of their houses, small construction firms, neighbourhood health clinics, etc. Whereas it is desirable to promote employment and incomes in promising and productive micro-enterprises, another side of the urban informal sector includes unhealthy and unsafe working conditions, child labour, exploitation by unscrupulous employers or middlemen, etc. For the ILO, this is the dilemma of the urban informal sector. Whereas clearly the formal sector cannot provide the employment opportunities needed by the poor, the ILO should not, with one hand, be promoting the forms of exploitative and unacceptable employment which it is trying to combat with the other.

However, labour-intensive urban infrastructure development and improving both employment, incomes and working conditions appear to go hand in hand in one of the rare win-win development strategies. First of all, the incomes which the urban poor earn as construction workers in labour-intensive upgrading schemes can subsequently help the same workers to invest in such small-scale business and income generating activities, including required capital investments. Also, infrastructure upgrading improves the productivity and working conditions for existing and new enterprises which operate out of poor and unplanned urban settlements. Road and footpath accessibility, proper drainage and sanitation all make a positive contribution to sustainable employment creation in these settlements. Therefore, there is scope for improving the conceptual and operational linkages between employment intensive infrastructure development and programmes to promote the urban informal sector since at least within the ILO these programmes appeared to be operated in the past as two autonomous and unrelated interventions.

**An overview of ILO's urban sector labour-based and informal sector programmes**

At this point, I will summarise some elements of ILO's involvement in urban labour-intensive infrastructure development projects as one means of providing operational responses to the problem of urban poverty as discussed above.

In 1987, I participated in an exploratory mission to Kinshasa, Zaïre to identify an urban "Special Public Works Programme". UNDP also requested that this mission be carried out in collaboration with the United Nations Centre for Human Settlements - Habitat, based in Nairobi. This programme went through a detailed formulation process, and by the time construction activities were ready to begin, the project had to be closed down due to the political situation in Zaire. Nevertheless, the project provided one model of community-based urban infrastructure development. The types of works envisaged, as in the projects mentioned by Tournée and Omwanza, were construction of access roads, including limited sections of street paving, erosion control and flood protection. This project also provided a first example
of ILO's collaboration with UNCHS-Habitat in the framework of an operational programme. The negotiation of this project with government authorities was a particularly delicate matter since a number of local and senior level officials were trying to get control over both the identification and selection of projects as well as the construction enterprises to be awarded the contracts. Such interference ran counter to the community-based approach with which the project was designed.

ILO's programme of labour-intensive urban infrastructure development has been supported by a series of two UNDP-funded inter-regional projects which have been referred to by Tournée and Omwanza. This first project, Employment Generation in Urban Works Programmes through efficient use of local resources, not only formulated the Kalerwe (Uganda) and Hanna Nassif (Tanzania) projects, but also carried out research studies, organised a workshop in Nairobi and produced the publication, From Want to Work. The approach developed is not limited to labour-intensive infrastructure development, but includes other complementary strategies to create employment and alleviate poverty through local resources. Therefore the issues of solid waste management, of increasing the productivity and incomes of workers in the urban informal sector and of micro-enterprise development were also addressed by this project.

UN system interagency collaboration within the urban sector

The second inter-regional project continues to address these issues, but in a collaborative framework involving also UNCHS-Habitat and the United Nations Volunteers Organisation. This project has carried out joint missions (involving officials and consultants from the Headquarters of the three agencies) to five countries (Bolivia, Colombia, Indonesia, Philippines and Tanzania). Other forms of collaboration are also envisaged in Nicaragua, Namibia, Uganda, Bangladesh and Vietnam.

Such UN-system interagency collaboration would appear to avoid duplication, and increase impact by bringing to bear the expertise of three UN agencies, each within the domain of its respective comparative advantage. For example, the land tenure issues discussed above fall more likely within the mandate of UNCHS-Habitat rather than within that of the ILO. Likewise, the United Nations Volunteers has considerable resources and experience in community participation which is invaluable for local involvement in upgrading unplanned settlements.

However, at the same time, in practice simple communications, coordination and joint planning and implementation have often been time consuming and cumbersome. Although the need for concerted effort in this field is greater than ever, we have yet to work out the best institutional mechanisms for "getting our act together" within the framework of the UN-system bureaucracy.

Urban sector initiatives in Francophone Africa and possible expansion of the ASIST model to the urban sector

I would now like to briefly mention labour-based development activities which are taking place in the Francophone countries of West Africa where demand is growing for community-based and labour-intensive upgrading schemes. Here, modelled partially after the Bolivian Social Fund, the World Bank and other donors have been funding special employment and infrastructure programmes in hopes of mitigating some of the negative impacts of structural adjustment programmes. The first such programme, AGETIP, was developed in Senegal, and now similar programmes are underway in Niger, Mali, Burkina Faso and Benin; whereas related programmes are being planned for other countries outside West Africa
such as Madagascar and Tanzania. Whereas these initiatives were positive in focusing attention to social problems in these countries, our approach towards them was cautious in that they carried the danger of falling into the trap of "make-work" programmes from which the ILO has been trying to disassociate itself over the past decade. In view of the urgency of the unemployment situation, the international community and government officials were looking for a "quick fix" solution to keep the lid on social unrest. Many of those who had been in the past criticising labour-intensive approaches as synonymous with poor quality and low productivity, were now turning to a characterised version of the approach to deal with what was all of a sudden seen as a social crisis.

Although the ILO at first had an "arm's length" relationship with these programmes, involving an evaluation of the Senegal programme as well as advisory missions to Senegal, Niger and Mali, we are now studying with the World Bank a collaborative programme to help make these programmes truly labour-based, not only in name, but also in practice. At present, projects where labour costs are only around 20 per cent of total costs are termed labour-intensive, and we think they can do better, without sacrificing quality and cost-effectiveness.

Another area where the ILO, based on the hard work of participants at this meeting, has useful experience is in the area of small contractor training programmes. Whereas the West Africa special employment programmes have been successful in quick delivery of infrastructure thanks to the use of streamlined contracting procedures which bypass the government bureaucracy and cut through red tape, they still have a long way to go in developing truly labour-based contracting procedures and technologies. Furthermore, many of the programmes are weak on community-based planning and project selection, an area which I have already discussed. An ILO support package to these programmes, in collaboration with the World Bank and other donors such as the European Union, is one way then to "piggy-back" our technical assistance onto already identified investment resources in order to increase their impact on employment creation and poverty alleviation.

In fact, we are exploring the possibility of creating a type of Francophone ASIST project, possibly with an institutional home in a regional engineering university in Ouagadougou, which could support labour-based programmes in West Africa. The mandate of such a support project would possibly be broader than ASIST's current mandate, by supporting urban as well as rural works, and multi-sectoral as well as sector programmes. By this I mean that other forms of infrastructure, in addition to roads, would be supported, including anti-erosion works, irrigation, afforestation, small dams, etc. Also, specific advisory services could be provided in the field of community participation.

I would also like to mention another possibility for ILO to deepen its capacity in urban sector labour-based infrastructure programmes. It would be extremely useful if a full time advisory post could be created within the ASIST Office in Nairobi. Such an advisor could provide much needed support to the various initiatives in the East Africa sub-region which were mentioned by Tournée and Omwanza. Also the Nairobi location would be ideal since it would permit close collaboration with UNCHS- Habitat, with its headquarters in Nairobi, in the framework of the Urban Poverty Partnership programme and other joint initiatives.

**Linking demonstration projects to employment and shelter policies**

Urban unemployment has been identified as a top priority by mayors of cities around the world during a Colloquium on Social Development held at the United Nations in New York last August.
Labour-intensive urban development provides one practical and concrete step which can be taken to help solve the problem of urban unemployment. I believe that any inter-regional programme should be built on the foundation of country-level demonstration projects of the kind discussed by Tournée and Omwanza. In order to have a significant impact on urban unemployment and poverty, we must carefully nurture, evaluate and improve such demonstration projects, since concrete results are the best means of influencing policy makers to adopt new approaches. "Seeing is believing," should be the ILO's maxim as it strives to provide policy advice on employment creation and poverty alleviation to urban technical and planning officers.

In the hopes of expanding and promoting the approach to donors, we are now, on the basis of the two inter-regional projects, designing a Programme known as the Urban Poverty Partnership. The design process has included a number of informal consultations with donors, a programming workshop held in the Hague in December 1993, and an evaluation, now underway, of ILO's activities being undertaken in the urban sector. The report of the Hague Workshop and the UPP Programme Document are available for this meeting.

The ILO's collaboration with UNCHS-Habitat has a number of facets, including a joint publication entitled Shelter Provision and Employment Generation which explores in great detail the upstream and downstream linkages between improved shelter and employment. Shelter here refers not only to housing, but also to the whole range of infrastructure and services which form the urban living and often working environment. The fact that in the urban unplanned settlements, the home is also often the workplace, is just one illustration of the close relationship between shelter and the world of work. It is for this reason that the ILO has in recent years strengthened and broadened its programme of collaboration with UNCHS-Habitat. In fact, this booklet will be a joint contribution of the two UN agencies to the World summit on Social Development to be held in Copenhagen next March.

About a year after the Social Summit, another world summit will be held in Ankara, Turkey. This will be the Second United Nations Conference on Human Settlements, also known as HABITAT II, or the Cities Summit. The ILO, within its mandate, is collaborating with UNCHS-Habitat in preparing for this summit. At present, we are exploring the possibility of organising regional workshops on the changing structure of urban employment, in order to arrive at a comparison of how the world's cities have evolved twenty years after the first UN Conference on Human Settlements which was held in Vancouver in 1976. However, as we participate in these various world forums dealing with problems of urban unemployment and poverty, we should never lose sight of the valuable experiences of our field programmes which provide us with the experiences on which all of our policies should be founded. In the world of the UN system there is unfortunately a habit of making lofty speeches and commitments in such world forums, without giving enough attention to the management and resource implications of how to put these ideas into practice in a complex and imperfect world. I strongly feel that the down-to-earth discussions taking place in this meeting of practitioners of labour-based programmes is one way of doing something about employment creation, rather than merely talking about it.
3. Education and training

3.1 Training in labour-based roadworks for Kenya's expanding national programmes and international courses

B.G. Ariga and D.W. Jennings, Ministry of Public Works and Housing, Kenya

Training for national labour-based programmes Kenya

History

Labour-based roadworks in Kenya began in 1974 in 4 selected districts of this diverse country. The districts were selected to provide sites representative of all regions being considered for inclusion in a larger programme. They were representative in respect of topographical, climatic and socio-economic factors.

These districts were:

Nyeri for highland, wet, regions
Kwale for coastal region
South Nyanza for Lake Victoria regions
West Pokot for the semi-arid regions

During the period 1974 to 1976 the pilot projects in these districts worked independently. There was a lot of expatriate input and Kenyan engineers in the programme were very few. Experienced qualified Kenyan engineers were still very few in the country and could easily influence their own appointments. Labour-based work was seen as a second class form of engineering, still having an aura of relief work. This left the way open for various donor employed expatriate engineers to run the pilot units with a very free hand. The controlling Ministry, Roads Department realised that work methods, techniques, and procedures in the various districts needed to be standardised, if the programme was to be put into effect on a national scale. The results so far had been very encouraging and a national programme of labour-based road construction and improvement was foreseen. This national programme became known as the Rural Access Roads Programme (RARP).

The objective of standardising the works led to the formation of a training site in one of the initial districts. The district chosen was Nyeri. Standard methods and procedures were agreed upon and put into practice on the Nyeri sites. The Nyeri sites were then used as demonstration sites for these standard methods. Out of these beginnings, the labour-based training unit was born. It was quickly realised that one essential feature for national success of this type of programme was to involve the national engineers. As the programme grew all new engineers coming into the programme were attached to the training unit before being appointed to implementing units in other districts.

As the programme expanded the training unit was moved to Kisii district. A small purpose built temporary facility was constructed at Suneka with the help of Swiss funding and more formalised
training for the programme began. Still the original objective for standardising the working methods and procedures remained top priority, now also training was aimed at maximising efficiency within the programme.

RARP was so successful, both in terms of its own objectives, and in terms of national political enthusiasm that labour-based methods were brought onto the classified road network in 1985 with the creation of the Minor Roads Programme (MRP). To cope with the training for MRP a more permanent training centre was built at Kisii. This complex is the present day Kisii Training School (KTS) training centre where all labour-based roads training for Kenya is carried out and the ILO international courses have been conducted. A map of the districts covered by the programmes is attached overleaf.

Throughout the period since the first training unit was set up in Nyeri these sites have been used as technology development and research sites. Technology development in Kenya programmes has gone hand in hand with training.
3.2 Training needs assessment - planning a training programme

J. Markland, Feeder Roads Programme, Mozambique

Introduction

The success of any labour-based road construction project is the result of a team effort. Each member of the construction team has a part to play in ensuring the smooth-running of the project. When a training programme is being planned, for either a new or for an existing project, the needs of each of the members of this team must be considered, and training prepared so that they may all work effectively together. This paper describes the steps which need to be taken in order to plan such a programme.

The author is currently working as training adviser to the Feeder Roads Programme (FRP) in Mozambique and this paper describes a review of training needs which is being carried out. Twenty labour-based construction brigades are now operational in nine of Mozambique's ten provinces, with plans for expansion to forty brigades over the next three years. Training has been an important element since the start of ILO's involvement with labour-based road construction in Mozambique. Formal training has concentrated on staff at supervisor level with courses closely based on the ILO Training of Supervisors Manual.

The proposed programme expansion and the need to integrate the FRP training needs within an overall training programme which is being established within the National Directorate of Roads and Bridges (DNEP) meant that a review of training needs was desirable.
3.3 Training of emerging contractors in labour-based construction

N.G. Band, Project Management Techniques

Executive summary

There is a vast need for the training of participants in the construction industry in South Africa to ensure that it will be able to meet the demands that will be placed upon it during the period of reconstruction and development.

"The Reconstruction and Development Programme - A Policy Framework (RDP)", published by the African National Congress, describes the South African Government's policy towards, amongst other things, the construction industry and a National Public Works Programme. Key aspects of the RDP include:

- job creation.
- the development of black owned businesses.
- the development of small-scale enterprises.
- skills transfer.
- human resource development.

One way in which these aspects can be addressed in the construction industry is through the training of emerging contractors in labour-based construction.

Whilst the development of emerging contractors complies with the RDP, the author also believes it to be essential to the construction industry's ability to produce what is required of it to address the country's needs.

The paper describes the manner in which emerging contractors are being trained in South Africa in line with the RDP. It assumes that the projects, or parts of projects on which these emerging contractors are employed, are suitable for labour-based construction and concentrates solely on the training aspects.

Introduction

During 1994, the African National Congress published "The Reconstruction and Development Programme - A Policy Framework" (RDP), which highlights the manner in which South Africa must be developed. The RDP is an integrated, coherent socio-economic policy framework. It seeks to mobilise all our people and our country's resources toward the final eradication of apartheid and the building of a democratic, non-racial and non-sexist future (cl 1.1.1).

There are many proposals, strategies and policy programmes contained in the RDP. These can be grouped into five major policy programmes that are linked to one another. The five key programmes are:

- meeting basic needs.
- developing human resources.
- building the economy.
democratising the state and society.

implementing the RDP (cl 1.4.1).

The RDP suggests that one of the first priorities in meeting basic needs is to provide jobs (cl 1.4.2). With 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 states 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 (cl 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 suggests that a housing 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).
- 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).

It is therefore highly desirable that construction projects should be structured in such a manner as to meet the following supplementary objectives, insofar as the local community is concerned:

- The community should, from the outset, be involved in all relevant decision making.
- The maximum number of jobs should be created.
- Entrepreneurship should be actively promoted.
- Skills should be transferred to the community.
- The amount of project funds retained within the community should be as great as possible.
- The community should as far as possible be actively involved in all aspects of project implementation.

There are, of course, certain constraints applicable to any project, irrespective of the supplementary benefits that may otherwise accrue to the community. These are the following:

- The project must be completed on time.
- Project expenditure must be within budget.
- The finished product must meet specified quality standards.

Fortunately, it has proved possible, by the use of carefully structured community-based development
projects, to meet the objectives set out above, whilst also conforming to the constraints.

In the implementation of any project then, the following project objectives could be considered to be prerequisites of the RDP to be complied with:

1. To involve the community at all levels of decision-making and in the implementation of the project.
2. To have the project designed and structured in such a manner that:
   - the number of jobs created on the project are maximised in an optimal manner for the beneficiary community.
   - entrepreneurial opportunities are generated in an optimal manner for members of the beneficiary community.
   - skills and competencies in technical, commercial, managerial and administrative areas are transferred to participants.
   - the percentage of construction cost retained by the beneficiary community is optimised.
   - members of the beneficiary community are, where possible and practicable, employed in the construction management of the project.
3. To have the project constructed to specification, within a specified period and a given budget.

There are a multitude of aspects that need to be considered, that interact with each other, when implementing the RDP. This paper will address specifically the aspect of the training of emerging contractors in labour-based construction. It will define the need to train the emerging contractors, following which it will describe the training material that has been produced and provide examples of the manner in which this training has been carried out.

Its intention is not to promote training of emerging contractors above labour-pool worker initiatives, main contractor initiatives etc., but to position it as an important and necessary link in the implementation chain of the RDP.

**The need to train emerging contractors**

**Emerging contractors**

The term "emerging contractors" may conjure up different perceptions in peoples minds. Accordingly we will attempt to describe what is meant by the term when it is referred to in this paper.

Emerging contractors:

- will generally be black.
- would originate from a variety of sources that would include:
  - those operating as contractors at the present time but with constraints and barriers in the way of development.
  - those operating in the informal sector as contractors, with a wish to enter the mainstream of the economy.
  - community representatives who wish to be involved in construction projects.
- must have a will and a desire to succeed.
The construction industry in South Africa, as in all parts of the world, involves contractors and sub-contractors. The strength of the construction industry is dependent on the strength and ability of both its contractors and its sub-contractors. The training required of emerging sub-contractors is similar to that required for emerging contractors. In this paper the term "emerging contractors" will include emerging sub-contractors.
Executive summary

This paper discusses some of the aspects of skills training related to an ongoing project in the Eastern Cape Province of South Africa. The paper highlights the particular problems encountered by the client and project manager in compiling a workable training programme acceptable to the training providers and to the Department of Labour. Some of the lessons learned so far on the project are included.

Introduction

Van Wyk & Louw Inc are the project manager for the construction of approximately 100 culverts and small bridges in the area of South Africa previously known as the Independent Homeland of Ciskei (now part of the province of the Eastern Cape). There are two phases of the project with approximately 50 culverts to each phase. Nine consultants have been appointed to implement construction works and the client is the Department of Public Works (Ciskei administration). All structures are to be constructed using labour-based methods. Application for accreditation of the project has been sought through the Accreditation Board for Labour-Intensive Construction (ABLIC) and Interim Accreditation has been granted on the bridges in the far north of the Ciskei. Our principal objective with regards to training was to ensure that all persons employed for construction work would receive accredited training.

What is accredited training?

Accredited training constitutes acceptance by the Civil Engineering Industry Training Scheme (CEITS) of the course material and the training provider, recognition of which is provided in the form of Certificates of Accreditation (see Annex 1). Accreditation of the training process must not be confused with the accreditation of the project which is the responsibility of the ABLIC. A document has, in recent months, been issued by CEITS explaining the process of accreditation of training on labour-intensive projects so that the process should be seen as an important, though relatively new, step forward in recognising the importance of training. Each trainee is issued with his or her own log book and the training provider enters all modules which the trainee has successfully completed into the log book. In this way, each trainee can build up a series of credits and later embark on a career path in civil engineering as a Grade III supervisor or artisan (see Annex 2).

Training providers

South Africa is endowed with many learning centres and training institutions. There are some 22 centres countrywide that offer skills training related to the civil engineering industry. For the project in the Ciskei, two local institutions were available to provide modular training skills necessary for the project. One of the institutions was accredited by CEITS, the other was not.
Problems of appointing a training provider

At the early stages of the project, there was little or no indication that any problems would occur, since, on the surface, it appeared as though it was a straightforward case of accepting the accredited institution to do all the training in phase 1 of the project, and merely advising the non-accredited institution to secure accreditation in readiness for the training effort in phase 2 of the project. This seemed the correct route to follow, particularly as the non-accredited institution showed no interest in providing information on their facilities, while the other institution was providing the information requested and showing strong interest in serving our training needs. But bearing in mind that these events were taking place shortly after the Transitional Government took office, and that old practises and structures were falling away, it was probably inevitable that change was in the air. The scenario changed somewhat over the course of a few months in the following manner:

● Firstly, our client was beginning to get a positive feedback from a certain area of Ciskei where the non-accredited institution was carrying out training on another civils project. Our client pointed out that the head-office of this institution was based in Ciskei, whereas the accredited institution's head-office was not. It was important to develop training resources within the region, he said.

● With this in mind, project manager Van Wyk & Louw prepared a draft training programme that basically gave the non-accredited institution 25% of the skills training inputs required.

● From a zero base to 25% of the training inputs was a major improvement for the non-accredited institution. However, during subsequent meetings it became clear that discussions on training at national level were pointing towards splitting up the country into certain geographic areas and appointing the various training centres to operate within their allocated region. The non-accredited institution clearly felt that, as they were located in the Ciskei and the other institution's head office was not, any training needs should be carried out by themselves. Moreover, they were now an accredited training centre with the Building Industry Federation of South Africa (BIFSA) and were now training successfully on a civils project in the region. We should have no reason to doubt their credentials and we were welcome to visit their training headquarters and to judge for ourselves as to the adequacy of their facilities.

● Meanwhile, the accredited training institution had heard of the arguments that were being put forward by the opposition and expressed their concern that, at the eleventh hour, we were now considering utilising the services of a training institution that was not accredited with CEITS and had shown no motivation for taking an active role in the skills training requirement.

● In our efforts to try and appease all parties, and following lengthy negotiations the situation was a stalemate:
  ○ the non-accredited institution wanted a larger slice of the training cake than was being offered.
  ○ the accredited institution wanted the whole training cake, or, at least, the lions share of it.
  ○ the client and project manager could not plan the skills training programme until there was a consensus.

● The end result after much soul searching and many platitudes, was that the skills training was virtually split 50/50 between the two institutions, whilst the entrepreneurial training, involving the training of small contractors, was given to the accredited institution.

Whilst it could be argued that the training should be awarded on the basis of the most competitive price
tendered by the institutions, the Department of Labour have a fixed tariff of fees which are payable to organisations which operate under contract for the delivery of training. Under these auspices, there is little scope for price competition between the various training organisations.
3.5 Small scale contractor training programme in Lesotho

C.E. Berentsen, Contractor Training Programme, Lesotho

Introduction

Despite its notable successes - or perhaps because of them - maintenance of gravel roads in rural areas by labour-based methods has been on the receiving end of a lot of criticism for several years, most of it misplaced.

- Much of this criticism is based on a misunderstanding of what the concept and proper execution of labour-based roadworks really is, and much of the rest reflects a limited assessment of its significance.
- The first camp are those who persist in only equating the unit rates of man-days and/or cost per km of roads completed with similar units of works by heavy machinery, avoiding the issue of location of the roads and consequently available local resources, level of introduced technology, classification/service of the roads in question and the aspect of employment creation through productive employment.
- The second set of critics concede that labour-based works often is effective, but dismiss it as merely a tactical method of employment creation.

Those who have been engaged in labour-based roadworks in Sub-Saharan Africa and Asia for some time know that this technology, when followed correctly in areas with favourably conditions, is a viable and well proven mechanism for more than just creating jobs.

The method of training personnel, whether casual labourers or project coordinators on a higher level of technical and financial responsibilities, can vary from country to country, and often from road to road, pending local conditions or even the duties of the persons who are being trained.

An issue which has been discussed among the relatively small family of labour-based "gurus" and their followers for some time, is whether this type of works should solely be performed under the auspices of local Governments, by small-scale independent contractors or a combination of the two.

To-day there is no hard and fast rule for which route to follow, but it is undoubtedly a need to expand in the direction of the second alternative, in particular in regions where unemployment is high, and likewise the interest of private enterprise.

The introduction of small-scale contractors in labour-based road maintenance and construction will not only create a healthy competition to stale bureaucratic governmental procedures, but also enhance an expansion and improvement of the technology at a different level and still fulfil the aspirations of job creation.

This short paper will briefly cover three aspects of training small-scale contractors in labour-based road maintenance in Lesotho, a training developed under a World Bank sponsored and ILO coordinated programme for the Lesotho Government through the Ministry of Works, a programme which started in 1993, and presently is at a point of training a second batch of contractors, expected to graduate in
October of this year.

The following frequently questioned, and important components of the training, will be covered as developed under the Lesotho course:

i Selection procedures of trainees (future contractors)

ii Training programme and material

iii Work after course completion

**Training of contractors in Lesotho**

**Background information on LCU**

Lesotho Labour Construction Unit (LCU) was established within the Ministry of Works in 1977. The LCU has later been given status as a full Department within the Ministry, with the responsibility for upgrading and maintenance of about 2500 km of rural roads since 1988. The LCU subsequently formulated a 20 year work plan of road construction, upgrading and maintenance which aims at achieving the following:

- Improved rural road communication.
- Larger scale employment of rural people.
- Increased and improved agricultural produce.
- Increased social services (e.g. health centres, shops etc.).

To date, the LCU has upgraded 800 km to a maintainable standard, and is upgrading roads at a rate of more than 75 km per year. Currently LCU has employed approximately 2000 workers, of which about 20% are women.

**Objectives of LCU**

The principal objective of the LCU is to provide functional rural road communication, in order to improve the socio-economic conditions of rural people of Lesotho.

The second objective is to promote the use of efficient labour-based construction and maintenance methods in the country, and thus create both assets and employment.

**Project background**

From the World Bank's first identification mission to Lesotho in mid-1991, when the team considered proposals for a five year Infrastructure Rehabilitation Project, until the official start up of the training programme of small-scale (private) contractors in labour-based road maintenance, it took less than two years.

As a result of an appraisal mission by the Bank in November-91, and a reconfirmation by LCU the Government's desire to promote small-scale contractors on labour-based maintenance, ILO was commissioned to prepare a study of the domestic contracting industry. As a result of this study, a proposal for IDA's assistance to the Government of Lesotho was prepared: "Entrepreneurship Development For Labour-based Road Maintenance". This proposal was submitted to the World Bank
A delegation by Lesotho Government officials visited Washington D.C. in May 1992 to negotiate a Development Credit Agreement with the Bank. This was followed by ILO's second involvement in the project through a formal request by Government of Lesotho to assist in the first part of the Infrastructure Rehabilitation Project. This was a 24 months assignment under the Infrastructure Engineering Project, during which the ILO should provide specialist personnel to produce lecture material, provide lecturing, co-ordinate the procurement of equipment and manage the training of 15 local small-scale contractors in labour-based road maintenance. After the signing of a Letter of Agreement between the Government of Lesotho and ILO, and the receipt of World Bank funds, the official start up of the Small-scale Contractor Training Programme was April 1, 1993.

After a slightly slow start in completion of draft training material and selection of a nominal group of qualified trainees as the first batch of students, the programme progressed through a combination of theoretical and practical training sessions.

In December 1993, 12 trainees received their certificates in routine maintenance, and decided to continue with the next and more demanding section of regravelling (periodic maintenance). In July 1994, after completion of further theory and 3-4 months tendered contracts, 8 of the first batch of trainees also graduated in regravelling.

I) Selection procedures of trainees (future contractors)

The main three lessons learned from the programme of the first batch were as follows:

1. All training material must be complete, at least in a final draft, prior to course start up.
2. It is imperative to design and follow a systematic and thorough selection procedure of the trainee candidates, in order to choose a sound and homogenous group.
3. A wide variety of experienced trainers combined with local expertise must follow the course through all facets of practical and theoretical training, but in a natural progression to prepare the trainees for the difficult combination of field work and sound business practice by the time they are awarded the first contract.

In order to meet the second requirement, and hopefully guarantee a full graduation of the entire second batch, the preparation for the recruitment, which took approximately four months, started already prior to the graduation of batch 1.

ADVERTISE IN RADIO AND NEWSPAPERS 2-4 WEEKS
APPLICATIONS BY FIRMS AND INDIVIDUALS 4-6 WEEKS
(60-80 candidates)
REVIEW AND SCREEN APPLICANTS: 2-3 WEEKS
WORKSHOP AND TEST: 1 DAY
(30-40 short listed)
SCREEN AND REVIEW TEST RESULTS: 1-2 WEEKS
INVITE FOR PERSONAL INTERVIEW: (14-16 Applicants)

VERIFICATION OF INFORMATION AND FINAL SELECTION: 2-3 WEEKS

(Short listed) TRAINEES PAY NON-REFUNDABLE

ADMISSION FEE: (12 Trainees)

12 MONTHS CONTRACTOR COURSE STARTS

Through the above sequence, coordinated by the entire technical LCU staff, a group of 12 very committed candidates have taken a full year off from their regular businesses, and have so far successfully completed all aspects of the initial 3 months of intense theoretical and practical training in routine maintenance, regravelling works and business aspects of labour-based road maintenance.

ii) Training programme and material

Although the selected group of trainees are both of a fairly equal background and experience, and all share a keen interest and dedication to the programme, a well designed training schedule with a progressive syllabus and relevant, quality lecture material is imperative for a course of this nature to succeed.

The following is the programme, revised from 1993’s first batch of trainees, and used for LCU’s second batch of contractors:

Training material

The 12 months training course is basically conducted in accordance with the two following manuals, produced by ILO and consultants:

IYCB (Improve Your Construction Business). This set of books contain three units, each split in a handbook and a workbook:

1. Pricing and Bidding.
2. Site Management.

This package of lecture material has been developed by ILO over a period of 3-4 years, and is therefore neither specifically tailor made to the LCU Small-scale Contractor Training Programme, nor do the exercises refer to road projects.

Modifications and additional exercises were therefore prepared before and during the training to cover case studies also beyond the more business oriented concepts.

ROMAR (Routine Maintenance and Regravelling)

This draft of training manual, also split in a handbook and workbook module was designed prior to and during the teaching of batch 1 of trainees in a very rough outline, and completed in draft form prior to start up of batch 2. All exercises are tailor made for labour-based road maintenance, and some with local emphasis. Mainly national Basotho engineers are responsible for the exercises in the ROMAR package.

This manual is broken down in the following ten chapters:
● Roads, Their Purpose, Terminology and Standards.
● Appropriate Road Construction and Maintenance Technology.
● Soil Mechanics.
● Equipment and Tools.
● Introduction to Labour-Based Road Construction.
● Road Maintenance.
● Routine Maintenance.
● Regravelling.
● Pricing and Bidding.
● Management of People.

The ROMAR manuals are expected to be edited and bound by the completion of batch 2 training.

As a result of this training programme, a Trainers Guide will also be compiled in a draft form for future use and reference to LCU and other similar projects.

This Guide will be split in three main sections, and is intended to tie together the use of the IYCB and the ROMAR modules:

● How to lecture following IYCB and ROMAR training manuals.
● Project procedures and contract management.
● Exercises.

iii) Work after course completion

The types, sizes and location of contracts to be awarded to the graduated contractors are very much governed by a supply and demand condition; not only as far as supply and demand of contractors are concerned, as the training can easily be adjusted, but more with respect to available funds.

So far, the routine maintenance contracts have been paid from Government funds in Lesotho, while the regravelling contracts have been funded by donors.

Based on a yearly average estimate of 105 km new constructed rural roads and a capacity of 12 km of a standard annual regravelling contract, a continuous requirement of 8 regravelling contractors will be required.

With a present road network of 800 km of roads which require maintenance, and a nominal size maintenance contract of 35 km, a present requirement of approximately 22 contractors qualified in routine maintenance is also required under LCU.

Recently, 4 regravelling contracts and 8 routine maintenance contracts were awarded by LCU through the Central Tender Board to the graduates from Batch 1.

Even if all the present 12 students of the second batch will graduate, there will still be a shortage of contractors, but a possible shortage of funds if all those who qualify in regravelling wish to tender for such contracts.

It should be noted, that a major incentive for the trainees of the programme in Lesotho, with its high
unemployment rate, is to lean on the LCU for a "guarantee" of contracts after successful completion of the very demanding programme, and with the very popular Certificate and Registration in hand.

Although such a "guarantee" cannot be given, needless to say, LCU is doing their utmost to fulfil such expectations within their powers.
3.6 Sustaining the labour-based technology in Ghana - the contribution of the
School of Engineering

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Abstract

The School of Engineering of UST is in collaboration with the ILO and DRF not only to build the
capacity of the university in the area of labour-based road engineering, but also to help in the long-term
sustainability of the technology of the country. Since in Ghana labour-based road technology cannot be
separated from the small-scale labour-based contractors, the School has undertaken field studies of the
operations of some of these contractors including a study of technical quality of the roads they are
building. Further, the School has also started research at the post-graduate level to provide local input for
establishing a firm rational basis for selecting between labour-based and equipment intensive
technologies for road construction. This paper reports on these activities aimed at sustaining the
technology in the country in the long-term.

Introduction

In Ghana, the administration of the approximately 36,000 km network of roads lies with the Ministry of
Roads and Highways (MRH) but road construction, rehabilitation and maintenance are planned and
executed by three line agencies made up of the semi-autonomous Ghana Highway Authority (GHA), the
Department of Urban Roads (DUR) and the Department of Feeder Roads (DFR). DFR, which is
responsible for the approximately 21,300 km of feeder roads in the country, was established in 1981 and
functions as a civil service agency under MRH. The constraints this status imposes on the effectiveness
of DFR and therefore on the sustainability of its efforts have been discussed elsewhere, as for example,

The concept of labour-based road rehabilitation was introduced to DFR through a component of the
World Bank sponsored Fourth Highway Project. With the International Labour Organisation (ILO) as the
executing agency and with funding from the International Development Association (IDA), the United
Nations Development Programme (UNDP) and the Government of Ghana, a pilot project to develop
labour-based technologies in Ghana was set up in 1986 in the Western Region of the country. One
distinguishing feature of the project in Ghana was the involvement of the private sector in the form of
small scale contractors from the beginning. An elaborate programme of training and equipping selected
small-scale contractors was developed as an integral part of the labour-based programme. The lessons
learnt from and some of the problems encountered in the development of the private sector especially
from the financial and institutional points of view have been discussed in previous seminars

So far, a pool of some 70 small-scale contractors have been trained to use the labour-based technology.
With an expected annual output of 20 km per contractor, the labour-based programme currently has the
capacity to deliver 1,400 km of roads per annum. The early introduction of the private sector to the
labour-based programme in itself is an important step towards sustaining the technology in the country in
The success of the labour-based rehabilitation programme in Ghana is said to be a result of the effectiveness of the contractor training and the subsequent close control and supervision given to these contractors by DFR as well as the technical and financial assistance given by the ILO and the funding agencies respectively. On the question of sustainability of the technology, one is seeking in the long term to maintain an acceptable net benefit from using the labour-based technology long after the technical and financial support from donors as well as the special protection accorded the labour-based contractors cease. Under such circumstances, labour-based contractors will continue to use the technology, only when they find it profitable to do so. As a further step towards the long-term sustainability of the small-scale contractors, the "Improve Your Construction Business (IYCB)" project was executed in Ghana by the ILO from 1990 to 1992, (Anderson, 1993). This project was the result of the realisation that a well-managed small construction enterprise is the key to the continued profitability of the labour-based technology. As part of this project, the constraints faced by small-scale enterprises in the construction sector were studied and documented by Miles and Ward (1991).

The institutional capacity of DFR itself is another important consideration for the long-term sustainability of the technology in the country. That the present capacity of DFR is inadequate for effective management of the relatively vast network of feeder roads is an issue which has long been recognised. Efforts at improving the institutional capacity of DFR include a component of the World Bank funded National Feeder Roads Rehabilitation and Maintenance Project (NFRRMP) which started in 1992.

However, another equally important consideration is the acceptability of the technology by the public in general and the technical leadership of the country in particular. The major problem with the technical leadership is attitudinal, based mainly on a misunderstanding of the nature of the technology. In Ghana, the use of communal labour for the execution of construction works such as public places of convenience, markets, schools and other public places is well known. In fact this laudable communal spirit was used as a basis for planning and executing routine road maintenance activities during the pilot phase of the labour-based programme. However, the experience of DFR with this voluntary communal system has been unsatisfactory. Among the technical leadership, there is the tendency to equate or at best associate this inefficient extensive use of labour with labour-based road engineering. In other words, the unique features of the technology such as optimisation of the labour content, the cost-effectiveness of the methods used and the high quality of the outputs together with the extensive socio-economic benefits it renders, are not yet appreciated by a vast majority of the technical leadership.

The ILO/DFR/UST Collaboration Agreement

The involvement of the University of Science and Technology (UST) in the labour-based programme started with a collaboration agreement involving the ILO, DFR and the Civil Engineering Department (CED) of UST. This collaboration agreement was formalised in June 1992. Prior to this, there had been exchanges of correspondence and material among the three institutions. With the ultimate objective of incorporating labour-based road engineering into the highway and transportation engineering and the construction engineering courses of CED, the collaboration agreement has three main components: contractor studies, short term studies, and post-graduate studies. This agreement fitted into a component of the SIDA-funded African Regional Projects dealing with the use of appropriate technology for road maintenance. This component concerns the establishment of collaborative ventures with selected African
Universities with the aim of incorporating learning materials on technology choice, management of labour-based road sector works and rural transport planning into the syllabi of civil engineering departments. In the collaboration agreement, the ILO through the SIDA project provides funding, DFR supplies the transport and facilitates the fieldwork, while UST executes the studies, putting its premises and facilities at the disposal of the studies.
3.7 Is training enough?

R.C. Petts, Intech Associates

Synopsis

Training must not be viewed in isolation, but as a key component of manpower development to meet the needs of the road authority.

Frequently, insufficient consideration to the operational environment of the trainees severely restricts the effectiveness of training.

The paper discusses some of the considerations that are essential in planning and implementing an effective training programme for labour-based roadworks.

Introduction

The paper discusses some of the issues that are important to consider, to achieve successful training for road authority personnel. They relate principally to aspects of the operational environment into which the trainees emerge.

Objectives

The objective of training can be stated as development of workforce knowledge and skills to improve the construction and management of the road network to satisfactory standards. This should be achieved in a cost-effective way.

The basic requirements

It is necessary to design the training to attempt to reduce or eliminate the existing knowledge or skill deficiencies. The basic steps required are:

A To assess the knowledge and skill requirements of the job.

B To assess the trainee's knowledge and skills.

This will allow the training requirements to be identified:

C Train to minimise the difference between A and B.

Monitoring and follow up, to assess the effectiveness of training, are aspects that are too often overlooked or inadequately pursued.

Other Considerations

Unfortunately the above assessment will only be the starting point for a successful training programme. Training is only one component of manpower development and should be planned and implemented in close conjunction with the development of the road authority operations. If this is not achieved, the
training efforts will have very limited impact. An integrated approach to tackling existing deficiencies is required.

A structured analysis of a road authority's operations will normally show a large number of problems that interact to severely restrict the performance of the staff and therefore the authority.

These constraints can usually be categorised under the following groupings:

- FUNDING
- INSTITUTIONAL
- TECHNICAL
- SYSTEMS
- MANPOWER

The funding and institutional problems and their possible solutions are beyond the scope of this paper.

The technical problems are relatively easy to identify. They are one of the principal reasons for the widespread efforts to replace heavy sophisticated equipment with more appropriate labour and tractor technology.

Systems for the planning, implementation and monitoring of work are also a significant problem area; the substantial "human" component makes establishment of effective systems elusive for many road authorities. This is due to the poor existing situation with regard to a number of important issues discussed later.

**Technical & Systems**

For training to be successful there are a number of technical and systems requirements that should be met. These can be summarised as follows:

- SYSTEMS SHOULD BE DEVELOPED AND FUNCTIONAL
- DOCUMENTATION AND MANUALS SHOULD BE AVAILABLE
- TRAINING MATERIAL SHOULD BE DEVELOPED
- TRAINING SHOULD BE PRACTICALLY & REALITY ORIENTATED
- TRAINERS SHOULD BE COMPETENT TO DELIVER THE TRAINING

These requirements can usually be satisfactorily met by the resources within the road authority, or by external experts/consultants. There have been notable successes in tackling the above training aspects for labour-based roadworks. These have brought about beneficial changes in the technical and organisational approach to roadworks in less developed countries.

**Manpower**

The Road Authority problem analysis will probably show a substantial number of constraints relating to manpower status, development and motivation. Compared to the technical and systems problems, these are usually far more difficult to overcome. However, unless these problems are effectively tackled, the impact of training will be severely restricted, even if the foregoing aspects have been properly addressed.
The following requirements are crucial to the motivation of trainees and the effectiveness of training:

- POSSIBILITY TO APPLY KNOWLEDGE AND SKILLS TAUGHT
- INDIVIDUALS AND ORGANISATION APPRECIATE THE IMPORTANCE OF TRAINING
- APPROPRIATE ORGANISATIONAL STRUCTURE AND RESPONSIBILITIES EXIST
- MANPOWER DEVELOPMENT PLANS EXIST
- INDIVIDUALS & ORGANISATION HAVE PERSPECTIVE OF CAREER DEVELOPMENT
- EFFECTIVE FINANCIAL & TECHNICAL AUDIT SYSTEMS ESTABLISHED
- REASONABLE REMUNERATION PACKAGE OFFERED

These issues naturally apply to the training personnel as well as the trainees.

Unfortunately insufficient attention has been given to these aspects in the past. Consequently the impact of training to achieve sustainable manpower development has been limited. The remuneration issue has been sadly neglected. The disastrous decline in the remuneration of African engineers, technicians, managers and other skilled personnel in the civil service sector over the last 25 years is well documented (Figs. 1 & 2). This trend is generally continuing unabated. Engineer and manager remuneration is now completely unrelated to the value of the assets and resources managed. Furthermore, there is insufficient appreciation of the potential added (or lost) value to the road network asset, relating to the efforts of these key people.

Engineers are often forced to supplement their meagre salaries though various authorised and unauthorised means. The end result is that "availability" of engineers to carry out their official duties is severely reduced as they must necessarily spend time each day on other activities. This is a wasteful use and mis-direction of a valuable resource. The result is that other initiatives to improve road authority performance are constrained by this motivation problem.

**Conclusions**

It is now time to dedicate efforts to restoring fair remuneration packages for engineers and other high skill personnel, either through civil service reform or other institutional and sustainable arrangements.

It is also necessary to insist that future training programmes are integrated with initiatives to establish a motivating environment for the targets of the training efforts. Although it may not be possible to fully tackle all of the issues raised, a concerted attack across the range of issues should bring about a marked improvement in the effectiveness of training and manpower performance. It will then be possible to reverse the dramatic decline in the local capability to manage Africa's roads.
3.8 Counterparts and technology transfer

J. Clifton, Feeder Roads Programme, Mozambique

Executive Summary

Donor agency experience suggests that technical assistance is significantly more successful in "technical" matters (e.g. engineering) than in "institutional" matters (i.e. training, technology transfer, managerial and institutional support).

Why?

● Are the technical problems easier to identify and solve as they relate to a "concrete" problem while "institutional" problems have less identifiable parameters?

● Are the practitioners of technical assistance demonstrating a poor capacity for addressing less easily conceptualised problems and solutions?

● Are better inter-personal skills required?

This paper does not relate the history of a completed project and draw conclusions which may be valid for other projects or countries. Rather, the policy for technology transfer and counterpart training now evolving in the course of the Mozambican Feeder Roads Programme is presented with reference to the received wisdom of other programmes and projects.

Feedback and criticism of these proposals are welcomed as this aspect of the programme is, like many institutional aspects in Mozambique, in a state of flux.

The Feeder Roads Programme, Mozambique is expanding very rapidly with currently 23 labour based construction brigades operational or mobilising nation-wide. Further commitments already secured will increase operations to at least 39 brigades by the end of 1995, with funding by a large donor consortium.

Introduction

Mozambique has just emerged from a generation of civil strife. Infrastructure in all sectors is deficient or weak. The entire social fabric of the country has been damaged with a large percentage of the population having fled their home areas.

As a result, education and technical training of all specialisation has been disrupted. Institutional, technical and management skills are deficient or very limited. Against this background the Feeder Roads Programme was established as a means of employment generation through rehabilitation of rural roads by labour-based methods.

At the outset it was agreed that counterpart staff should be appointed to all technical assistance staff. However, the establishment of the National Directorate for Roads and Bridges (DNEP) was no better placed than any other Mozambican institution and suitable staff were not initially available.

Thus a scheme for sponsorship and recruitment of undergraduate and recently graduated engineers has been established for the Directorate as a whole including the Feeder Roads Programme.
Those counterpart staff are, almost without exception, lacking practical experience and are new arrivals in an institutional environment which itself is seeking to improve its capacity a and resources. Thus, the traditional three factors for success of technical assistance (i.e. commitment of the parties, design of technical assistance, and flexibility of technical assistance management) have been considerably influenced by the circumstances surrounding the development of the programme.

Firstly, the commitment of all the parties to a strategy for development of counterparts is strong. However, the design of the technical assistance which would normally involve choices of:

i) mode of delivery.

ii) role of recipient and technical assistance staff.

iii) administration arrangement.

have been severely limited by the constraints noted above.

For reasons of practicality a number of normally available options are not realistic in the present and past environment. However, circumstances are changing rapidly and thus, management processes of the technical assistance must be flexible in order to accommodate redesign of implementation processes made necessary by increased institutional and personal capability on the part of recipients, even if the ultimate goals do not change.

In Mozambique, today's circumstances are very different from those of one year ago and it can be expected that the passage of another year will bring change of equal magnitude.

**Commitment**

That there was, and is, a clear need for technical assistance is clearly understood by all parties. However, the past perception of technical assistance was as a line function with training and technology transfer as a side issue. The future thrust of technical assistance must be a transfer of emphasis onto institution building and counterpart development leading, during the course of the next few years, to assumption of executive responsibility by these counterparts. Commitment of senior recipient management and technical assistance is confirmed. Commitment of the counterparts themselves can only be gained by their confidence in the aims and tangible results of the technical assistance project.

To this end it is planned to shortly hold a seminar for all counterparts, directly involved technical assistance staff and senior DNEP management which will explore the definition of the counterpart and technical assistance role, working methods to increase the likelihood of successful technology transfer, changes required in institutional and personal attitudes and the preparation of guidelines.

**Design**

There are normally four technical assistance models:

a) Line function model - execution of a task or responsibility by technical assistance staff.

b) Apprentice model - counterpart acts as an apprentice to the technical assistance.

c) Team (collaborative) model - technical assistance and counterpart act as a team with line tasks and
d) Adviser model - technical assistance is purely an adviser to the counterpart who undertakes the line function.

The history of technical assistance and technology transfer to counterparts in Mozambique has been to opt in project documents for option b), but actually execute these projects using option a). Now that most technical assistance posts have counterparts in place, albeit with very limited practical experience, option b) has now become possible. Option c) is the next step as counterparts increase their experience and in some cases undergo further training and this is tentatively starting. It is expected that this option will continue for approximately two years to about the end of 1996, which will also give time for further strengthening of the institutional arrangements of the National Directorate and for resources for the counterparts (e.g. transport, support facilities, funds for travel and subsistence) to be acquired either through government or donor commitment. Option d) will then be phased in over the following two years to the end of 1998.

Obviously progression through these options will vary with the different counterpart situations. A further element is training of counterparts which will take the form of not only on-job training (the thrust of training will be transferred to provincial and district initiatives from the centralised efforts of the past) but also fellowships and sponsorship of advanced courses e.g. relevant M.Sc. and other specialised courses.

**Flexibility**

This is of paramount importance in the Mozambican situation. The present project document was produced while fighting was still going on and thus has been overtaken by the dramatic change in circumstances since the peace accord was signed.

Travel by road is now possible to all parts of the country for the first time in over a decade and the scale of operations has mushroomed such that control and management is a real problem as weak institutional capacity is exceeded. An effectively line function technical assistance model has become an apprentice model.

Current technical assistance to the Feeder Roads Programme effectively ceases at the end of 1995. A proposed project document for an extension of technical assistance to the end of 1998 has been produced and is currently the subject of comment between government and donor agencies. This technical assistance will seek to continue the progression of counterpart development through the team/collaboration model to the adviser model, while providing resources to counterparts to be able to function effectively in an executive role.

**Monitoring**

A system of monitoring matrices based upon the World Bank Staff Appraisal Report for the ROCS (Roads and Coastal Shipping Project) has been adopted. With some reservations, examples of the monitoring matrices are included in Annex 1.

Although there is a sense of attempting to enumerate the unquantifiable this system will be used for the foreseeable future, the assessments to be carried out jointly by technical assistance team member and
counterpart at six monthly intervals. (In fact the differences in scoring when the matrices are completed independently by technical assistance and counterpart are a most interesting manifestation of the different perspectives.)

**Problems**

Everyone engaged in development projects or technical assistance has at least one horror story of a technical assistance/counterpart situation which goes seriously wrong.

There are various circumstances:

- technical assistance not performing.
- counterpart not performing.
- combination of both (inter-personal problems).

which may be the result of a poorly designed technical assistance package, lack of resources, lack of experience or aptitude and attitude problems.

To date problems have been mainly concerned with lack of counterparts and lack of facilities to enable a counterpart to consolidate his position as effectively as possible. As the numbers of counterparts increase so the problems due initially to inadequate resources and to a lesser degree due to aptitude and attitude problems are increasing. There is currently no formal framework to resolve problems as they arise. The normal method in such cases is complaint by counterpart or technical assistance team members to their respective superiors about the attitude, capability or personal characteristics of the other, which is then taken up by project manager/government agency level. Traditionally this method has not had a high success rate in resolving such inter-personal problems, which has sometimes led to the removal of staff. It has thus been proposed that the powers and duties of both recipient body (DNEP) and executing agency (in this case ILO) will be set out in a jointly agreed terms of reference for future technical assistance.

Although it is hoped that some steps will be taken to resolve this problem as a result of the seminar mentioned in the section about commitment in page 238, the most serious constraint appears to be passivity of attitude on the part of the counterparts. It is stressed that this is not solely an attitude problem, but a reaction to the organisational situation in which he finds himself. Every attempt has to be made to ensure the receptivity of the counterparts by trying to arrange necessary resources to permit them to function adequately in their post, although it is not expected that any topping-up of salary will be involved.

**Conclusions**

Successful technology transfer and counterpart training can only be claimed when, at the end of the technical assistance assignment, the technical and managerial capability is available in house to the recipient entity.

However, sustainability of a function is dependent not only on the capability of national staff to undertake a particular function. They cannot function without the wider technical and material resources to do the job, in this case the means to continue to pay for the road rehabilitation and maintenance, replace equipment, buy spares and tools, pay workers and so on. Sustainability is the goal. Technology
transfer is one aspect only, albeit an important one, of the wider picture of planning for realistically sustainable operations.

Annex 1

1 Ref.: Proceedings ASIST Regional Seminar Lesotho 1992 "Training for Change" by D.W.Jennings. 2 Impact study RARP 1984, and MRP (Danida) 1990 1 The five universities are, UST (Kumasi), Univ. of Ghana (Legon, Accra), Univ. of Cape Coast, Univ. College of Education (Winneba, est. 1991) and Univ. of Developmental Studies (Tamale, est. 1992).

2 A new educational reform programme currently in operation in Ghana will transfer the responsibility for diploma education to the polytechnics from 1996.
### 4 Information material for field visit to Soweto's Contractor Development Programme

#### 4.1 Programme for field visit

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Speaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>08.30</td>
<td>Bus departs from Wits University</td>
<td></td>
</tr>
<tr>
<td>09.15</td>
<td>Arrive at Jabulani (UBC)</td>
<td></td>
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<tr>
<td>09.30 - 09.35</td>
<td>Welcome (Soweto City Council)</td>
<td>Dick Hallet, City Engineer, Soweto City Engineers' Department</td>
</tr>
<tr>
<td>09.35 - 09.40</td>
<td>Welcome (National Black Contractors and Allied Traders Forum)</td>
<td>Joe Magagula, Grinaker Contractor Development</td>
</tr>
<tr>
<td>09.40 - 09.50</td>
<td>Overview</td>
<td>Graham Nevin, Projects Branch, Soweto City Engineers' Department</td>
</tr>
<tr>
<td>09.50 - 10.00</td>
<td>Structure of programme</td>
<td>Ron Watermeyer, Soderlund &amp; Schutte Inc.</td>
</tr>
<tr>
<td>10.00 - 10.05</td>
<td>Design of water</td>
<td>Ron Watermeyer, Soderlund &amp; Schutte Inc.</td>
</tr>
<tr>
<td>10.05 - 10.10</td>
<td>Design of roads</td>
<td>Tom Marshall, Van Niekerk, Klein and Edwards</td>
</tr>
<tr>
<td>10.10 - 10.20</td>
<td>Materials management</td>
<td>Sam Amod, Project Management Techniques</td>
</tr>
<tr>
<td>10.20 - 10.25</td>
<td>Construction Manager's perspective</td>
<td>Charles Ndhlleleni, Grinaker Contractor Development</td>
</tr>
<tr>
<td>10.25 - 10.30</td>
<td>Construction Manager's perspective</td>
<td>Christo Coetzer, Du Toit Lombard and Malan Inc</td>
</tr>
<tr>
<td>10.30 - 13.00</td>
<td>Visit Klipspruit (roads)</td>
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<tr>
<td></td>
<td>Malapo (Secondary Mains), Moroka (plumbing)</td>
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<tr>
<td>13.00 - 13.30</td>
<td>Boerewors rolls at stores</td>
<td></td>
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<tr>
<td>13.30 - 14.00</td>
<td>Visit stores</td>
<td></td>
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<tr>
<td>14.00 - 14.15</td>
<td>Travel back to Jabulani (UBC)</td>
<td></td>
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<tr>
<td>14.15 - 14.25</td>
<td>Training</td>
<td>Steve Mokone, Promatra Training Services</td>
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<tr>
<td>Time</td>
<td>Session Title</td>
<td>Speakers</td>
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<tr>
<td>14.25 - 14.50</td>
<td>What the programme means in practise</td>
<td>Cas Bhamjee, Soderlund &amp; Schutte; Vusi Msweli, Du Toit Lombard &amp; Malan Inc.; Obed Ndlovu, National Association of Civil Engineering Contractors; Laban Phosa, National Association of Civil Engineering Contractors; Sipho Mazibuko, Contractor</td>
</tr>
<tr>
<td>14.50 - 15.00</td>
<td>Concluding remarks</td>
<td>Nic Band, Project Management Techniques, Promatra Training Services</td>
</tr>
<tr>
<td>15.00 - 15.45</td>
<td>Questions</td>
<td></td>
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<tr>
<td>15.45</td>
<td>Return to Wits University</td>
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</tbody>
</table>
4.2 An Overview of Soweto's Contractor Development Programme

R.B. Watermeyer, Soderlund & Schutte Inc

Introduction

Soweto's Contractor Development Programme (CDP) is a unique programme which embraces labour-intensive methods and labour-based technologies. It furthermore encourages and trains the community to participate in the managerial, commercial and administrative aspects of construction. The programme, by its very structure, increases the labour-content of a construction project and, at the same time, trains local entrepreneurs in labour-based construction methods of installing services. In this way, technical, commercial, managerial and administrative skills are developed within the community with a concomitant increase in earning capacity. At the same time, the community retains and cycles a significant proportion of the money spent on a project. Local entrepreneurs who are from the outset, employers in the community can, with sufficient technical, financial support and instruction, become fully fledged contractors and, as such, provide greater earning opportunities for others in the community. Thus the project may be described as a job creation programme with the potential for sustainability through entrepreneurial development.

The programme objectives of the CDP may be 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.

Project objectives, on the other hand, may be described as being to have the works constructed to specification within a specified period and a given budget using community-based contractors 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.

The reconstruction and development programme

The Reconstruction and Development Programme (RDP) 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 (cl 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 a housing 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. Although they were developed before the formulation of the RDP, they are in harmony with the RDP in that projects which are executed in terms of the programme create jobs, develop skills, address affirmative action and target disadvantaged communities.

Current projects

Township roads (R 70 So)

Background

Approximately 300 km of the total road network of 850 km of minor roads (residential and minor collectors) in Soweto are unsurfaced, in poor condition and are difficult to maintain as gravel roads. The roads are susceptible to severe storm damage during the rainy season. Apart from the high cost of maintenance of the roads, the Soweto City Council spends in excess of R2 million per annum, a figure well below which it should expend, in removing silt that has washed from the roads into the stormwater system. At the same time, these unsurfaced roads are located in fully developed areas and give a rundown appearance to these areas.

Scope of project

The project entails the surfacing of streets, the provision of kerbing to accommodate the flow of stormwater and, where necessary, the installation of underground stormwater drains to allow for efficient run-off.
**Project status**

Approximately 30,000 m² of roads have already been constructed in terms of this programme and construction on a further 21,000 m² has commenced in terms of the current DBSA/CWRSC loan agreement.

**Water house connections (W5 So) and the upgrading of secondary water mains (W22 So)**

**Background**

When Soweto was originally developed, most secondary water mains were laid along mid-block boundaries. The need for connecting pipe work was largely eliminated, since latrines and standpipes were located within a meter or two of the mid-block water mains. The piping used was 50 mm diameter black steel piping, with screwed and socketed joints.

The use of small diameter mid-block water mains resulted in the water supply system suffering from several inherent defects, principally:

- The small size of the mid-block water mains meant that the quantity of water that could be supplied to consumers was severely limited.
- The system of fire hydrants in roadways was, unavoidable, sub-standard, since most road reserves did not contain water mains.
- Metering of water consumption was impractical because of the difficulty of reading inaccessible meters on private properties.
- Maintenance of mid-block water mains by the local authority was hampered by limited access to the mains.

The following problems arose and became serious:

- Furring up of pipes.
- The original reticulation of small steel pipes could not meet the consumers' increasing water demands.
- External corrosion of the steel pipes due to stray electrical currents and acidic soil conditions resulted in leakage of alarming proportions.
- The number of fractures in secondary water mains average between 350 and 400/month.

The upgrading programme was implemented to remedy the situation.

At the outset of the upgrading programme, it was recognised that the new secondary reticulation could be broken down into water loss management districts. Accordingly, the districts which have been created incorporate 3.8 to 6.5 km of secondary mains and depending on the size of erven, comprise between 250 and 750 erven. Each district has been designed and constructed in such a manner that the districts:

a) Can be permanently isolated from adjacent districts by the closure of not more than 5 inter-district valves.

b) Are supplied, when isolated with water from a single off-take from a primary main.

c) When isolated, can supply water to erven at the minimum rate of flow under residual peak flow and fire conditions.
d) Can be supplied with water from preferable, an alternative primary main, or adjacent district at a reduced pressure and flow rate, in the event of repairs being required on the primary mains serving the district.

Thus, should a meter be installed at the inlet to the district, this meter could be used to establish the following:

a) average flows.

b) peak flows.

c) night flows.

Changes in peak and average flows, as well as high night flows, would indicate the presence of leaks. District inspection and further investigations may then be carried out to locate the leak.

District meters could also provide valuable information relating to design parameters which may lead to more economical designs on future upgrading projects and new townships. At the same time, the information obtained from these meters could be used to monitor consumer usage patterns, so that future extensions to reservoirs and the upgrading of primary mains may be undertaken on a just in time basis, i.e., only when the actual consumer demand necessitates increased storage capacity or supply.

**Scope of project**

The work includes the construction of 90 to 200 mm diameter secondary mains in the road reserves and their connection to the existing plumbing installations on erven.

The design approach is as follows:

- All small diameter secondary water mains are to be replaced by new secondary mains, with a minimum nominal diameter of 90 mm, located within the road reserves.
- Fire hydrants are to be provided of the new mains in accordance with the requirements laid down in the Department of Community Development's "Blue Book" for a low-risk, Group 2 fire-risk category.
- The new reticulation will be able to supply residential areas with an annual average water demand of 900 litres/day/erf.
- The new reticulation will be broken down into water loss management districts, in order to facilitate the early detection of water losses. (typically, approximately 5 km of secondary mains can be isolated from the trunk mains and be metered.)

**Project status**

The project when completed will have involved the laying of some 560 km of secondary mains and the replumbing of 56 000 erven. To date, approximately, 30 000 erven have been replumbed and 290 km of secondary water mains have been laid.

**Evaluation of project**

**Background**
The Soweto City Engineer's Department and their consultants have developed a procedure to appraise projects in terms of the objectives set out in paragraph 1. In terms of this procedure, the following items are examined:

- 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 to that of conventional construction.

The above mentioned parameters are then used to compute a Project Index for the project. Thereafter the delivery of the programme as a whole is examined.

**Evaluation of parameters**

The multiplier in employment opportunities in construction activities using the proposed labour-based construct methods are:

- excavate and backfill for water reticulation 1.9
- excavate, lay pipes and backfill water reticulation 1.4
- construct concrete block paved roads 2.3
- construct waterbound macadam roads 4.7

The remaining key parameters which have been established on specific projects following a rigorous analysis are as follows:

<table>
<thead>
<tr>
<th>Project</th>
<th>Type of Construction</th>
<th>Estimated cost/man-hour (Rand/man-hour)</th>
<th>Percentage of construction cost retained by the community (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R70</td>
<td>Waterbound macadam roads</td>
<td>17.9</td>
<td>37</td>
</tr>
<tr>
<td>R70</td>
<td>Concrete block paved roads</td>
<td>18.4</td>
<td>37</td>
</tr>
<tr>
<td>W22</td>
<td>Secondary watermains</td>
<td>17.4</td>
<td>39</td>
</tr>
<tr>
<td>W5</td>
<td>House connections</td>
<td>17.1</td>
<td>50</td>
</tr>
</tbody>
</table>

All of the projects, with the exception of R70 (township roads) are expected to have construction costs less than or equal to conventional and/or plant-based costs. A study has shown that road construction is expected to be approximately 15% more expensive than plant-based construction.

By way of comparison the average cost per man-hour in the civil engineering industry as a whole is R37.50. A NHF report has shown conventionally constructed roads to be well above this average value. The Framework Agreement labour-based projects which are currently in progress in the Western Cape have only 12% retained by targeted labour, i.e. the community.

It should be noted in this regard that a National Housing Forum report entitled "The Development of Small Scale Enterprises, Skills, Entrepreneurship and Employment Opportunities through the provision of Housing" makes the observation that when comparing costs, it should also be borne in mind that
labour-based construction practices will probably become more cost competitive since current cost comparisons with conventional construction practices have been undertaken in a recessionary period where plant on most projects have been priced at unrealistically low levels.

**Project Indices**

The Project Index may be evaluated from the following formulae:

\[
PI = \frac{20}{EEC} + 1.75 \frac{PCR}{100} + \frac{ECC}{EPC}
\]

where \(ECC/EPC \leq 1.0\)

where

- **ECC** = Estimated cost of conventional construction
- **EEC** = Estimated expenditure per man-hour of employment generated
- **EPC** = Estimated project construction costs
- **PCR** = Percentage of construction cost retained by the community

The Project Indices in respect of the various projects which have been analysed on a rigorous basis are as follows:

**Project No.**  **PI**

R70 So  2.6  
W22 So  2.8  
W5 So  3.1  

(A threshold value of 2.3 has been proposed. Projects having a PI below this are considered to be unacceptable. By way of comparison, plant-based construction has a PI below 2.0 and the current Framework Agreement labour-based projects in the Western Cape, a value of 2.1).

**Conclusion**

All the projects proposed have Project Indices above Soweto's threshold limit and therefore comply with Soweto's programme objectives. At the same time, all the projects produce employment at a unit cost below the average for the construction industry and hence may be regarded as being labour-based.
4.3 Soweto's Contractor Development Programme - a contractor's view

S. Mazibuko, Owner, Mazibuko Civils

What I have learned

Labour-based construction came to me as an eye-opener in terms of civil engineering. Prior to my training I had no inkling of what constitutes civil engineering projects. I did not know, for example, what fittings are being used in civil works, except what I saw when I passed construction work in progress. The knowledge that I have acquired in labour-based projects is as follows:

- Project Planning: Undertaking set objectives using resources to achieve the ultimate goal within the constraints of time, cost and quality.
- Organising the Project Plan: Undertaking and organising the project in terms of tasks, time and quality. An organisation chart must be drawn based on a work breakdown structure; giving a brief description of duties that will be undertaken by the people that are involved in the project.
- Direct the Project Plan: Delegating the persons that are in charge of the labour work force on site which involves communication skills coupled with motivation and co-ordination. Not doing these vital things will be like the right hand not knowing what the left hand is doing.

Problems

- The first problem that I encountered was working with a plan that did not show existing services, which resulted in several damaged services.
- Trying to make labourers maintain the standardised specification i.e. right measurements of the trenches. At times you are not on site for some time during the day, you find out that your trenches are zigzagging. In other words you must have a disciplined team.
- Non-availability of materials and fittings on site.
- Tools quickly get damaged or worn out and need constant replacing.
- Materials and fittings not arriving on time on site (not regularly happening).
- At times you get co-operative residents. That is where you must be a good PR man.
- The place that had the biggest problems was the Zola area where thuggery, robbery, and intimidation was at its worst. By maintaining cool tempers we weathered the storm so that at the end we were friendly with those tsotsis to the point that they simply started ignoring us.
- Closing of water supply without notice by Water Branch during pressure testing of lines was a major problem in terms of time and cost.

Progress made and lifestyle

Since I started working on these projects I have achieved quite a number of good things in life. I have managed to build my family a new house and bought myself a bakkie to make my work professional and productive. As for my family and personal lifestyle our life has improved tremendously. My involvement with these projects has changed my life completely. Maybe it's what you call a "re-distribution of
wealth”.

**Why should I get another contract?**

The most important reason of all is that I have been acting as a faithful agent for my employers and their client. The result and quality of my work speak for themselves. Also I had taken over and completed other projects that have been abandoned by other contractors.

I have the necessary experience and skills to undertake work on bigger contracts than the present and past ones, and I have and I have an experienced and reliable labour force on my hands.

So what it means is that I have a very experienced labour force on my hands.

**Project control**

Controlling a project is very important in terms of time measurement, i.e. the required time to finish the project. Also included is cost and quality performance. In controlling a project I also learned that forecasting and not deviating from the original plan is also very important. Also getting a feedback from your site foreman.

**What makes a good contractor?**

a) We must maintain a high standard of personal and professional conduct.

b) We must advance the integrity and profession by practising in a dignified manner.

c) Support other contractors by actively participating and encouraging them.

d) Provide suitable working conditions and opportunities for your staff.

**Have these contracts been successful and why should they continue?**

In terms of the standard achieved I strongly believe that they have been successful, although we had very serious problems that nearly resulted in the discontinuation of the projects in the past. We have eliminated most of these problems. We will continue to find and minimise these problems.

Another important factor about these projects is that they create job opportunities. Considering that one contractor employs about 25 people with an average of five dependants per person that means 125 people are benefiting from one contract. That is one of the strongest reasons why I encourage the continuation of these projects.
4.4 Soweto's Contractor development Programme - training

S. Mokone, Senior Trainer, Promatra Training Services

I am addressing the training of contractors in management skills in Soweto's Contractor Development Programme. whilst this is the specific project on which I am presenting, the many aspects that I will cover are similar on every project on which I have trained over the past 18 months. My area of training includes parts of the NW Province, Eastern Transvaal and Gauteng. The civils projects on which I have trained include Soshanguwe, Atteridgeville, Soweto, KwaGuqa, Duduza, Vosloorus and Meadowlands. In addition to which I have trained in several other areas.

The aspect that strikes home the most in each of the areas is the will and desire of the trainees to uplift themselves. They clearly realise that in order for this to happen they need to enhance their knowledge of the construction industry. In general, they approach training with tremendous enthusiasm and the results thus far have been extremely encouraging.

What has been particularly rewarding is the fact that several of the trainees who originated from informal settlement areas with little or no knowledge of the construction industry have gone on to make successes of their own businesses. In other instances, contractors who started being trained whilst already operating as contractors have increased their turnover by up to ten times.

In Soweto, the training commenced with an introductory course given by Entrepreneurial Development South Africa (EDSA) and then moved to Promatra's Construction Management Course. The training that I have been giving is the latter, which transfers skills and competencies to the contractors in the areas of:

- tendering and estimating
- planning
- execution of a contract
- managing of resources
- quality control

The training has been given once a week in Soweto to allow the contractors the opportunity to attend the lectures without having to upset their work routine.

The format of the training is Competency Based Modular Training (CBMT) which is adult learning ideally suited to local conditions. It allows the individual to progress at his pace and allows him to put in extra study should he see fit.

Due to the nature of the projects it has not been possible for all the contractors to attend every session. The utilisation of the CBMT format means that contractors are able to obtain benefit from every period attended. If they miss the training for any length of time, they can catch up when convenient to them as each module is independent of the others. This also allows the attendance to the course of "new" contractors who might have missed a portion of the training.

I believe formal training to be an essential part of any project that includes contractor development as a part of its aims. Without such training I do not see that the contractors will be able to progress beyond
their present status. With such training, as I tell the contractors, "the sky is the limit".
Material management within the Contractor Development Programme - a brief overview

S.A. Amod, Project Management Techniques

Introduction

Labour-intensive construction projects can take many forms. To obtain the maximum benefit, the projects should be linked to training and development programmes which will elevate at least some of the beneficiaries to a level of greater capability and, ultimately, removal from the cycle of poverty which so often characterises job-creation schemes. Such a programme is Soweto's Contractor Development Programme which trains contractors in the areas of management, administration and commercial skills, and provides developmental support to the emerging entrepreneur.

The emerging contractor faces many barriers which are outlined in detail by others. A very significant problem concerns the procurement of materials and small plant for construction. Training will assist in transferring knowledge of contractual requirements, such as provision of sureties, and the skills of tendering, but nothing can initially be done about the following disadvantages which the small contractor faces:

- Lack of financial credibility.
- Lack of experience in procurement.
- Lack of resources for the purchasing and storage of materials.

In addition to these there is the advantage that a central materials procurement operation serving a number of contracts has:

- The bulk purchase discounts obtained.
- The central storage advantages of security and control.
- Economies of scale.

The materials management function is therefore integral to the Contractor Development Programme in Soweto. Labour-based projects, and labour-intensive construction in general, can benefit from the materials management function being provided by either the managing contractor or the development team. As the contractor-in-training develops and succeeds in obtaining sustained work and financial credibility, the job of procuring materials may be passed over to him.

The following is a brief overview of the objectives, advantages, and the process of materials management as practised in Soweto.

Purpose of materials management

The main reason for having a Materials Manager on labour-based projects is so that the barriers which have been outlined may be surmounted. An additional reason is that the reticence shown by some developers and funding agencies to provide funding to inexperienced contractors may be overcome by keeping 30-50% of the cost of construction (the cost of materials) under the control of a professional
agency who only issues the materials as they are required by the contractor. It also overcomes the problem of the discontinuity of work experienced by individual contractors.

The Materials Manager serves both the emerging contractors as well as the Client (the funding agency). To each contractor he behaves as though he were the procurement section of a conventional contractor. This means that materials must be procured in advance of their required time, at the best price, of adequate quality, and in a professional manner. To the Client, the Materials Manager ensures that the materials purchased with the Client's money are properly stored, are secure, and are only distributed to qualifying contractors. Advantage must be taken of the best market prices and settlement discounts. Money must not be wasted on excessive purchasing and the stock (bin) levels must be maintained at the most efficient level.

To all parties the Materials Manager's reports are of vital significance. This makes the controls and the administrative systems employed by the Materials Manager most important.

**The systems and the process**

Perhaps the most important quality that the systems employed should have, is that they must be easy to use by the site staff, i.e. Construction Manager, Contractor and Store-man. The systems must also provide sufficient clarity for contractors, Construction Managers and Clients to understand what materials have been issued, to which contractors, and at what price.

The Materials Manager generates and updates a comprehensive list of materials, which in some instances will include plant and consumable items, for use on labour-based projects. He also develops relationships with manufacturers and merchants, for bulk items such as HDPE and PVC piping, cement, pipe fittings, aggregates, etc.

The annual materials tender attempts to cover the materials required for all projects to be constructed in that year. This is adjudicated by the Materials Manager with the assistance of the Design Consultants and the approval of the Client. Suppliers are then appointed who will provide materials according to a schedule drawn up by the Materials Manager.

The nature of the Reconstruction and Development Programme and labour-based projects makes it desirable to support small merchants and suppliers. This is generally done for items where the small supplier can compete with the larger organisations, as well as for items where the proximity of the small supplier to the construction site is advantageous. Small suppliers also frequently have fewer administrative bottlenecks and are able to procure items in short supply at short notice. They are, of course, free to compete with the larger suppliers in terms of the annual materials tenders.

Since the Materials Manager generates tenders on an annual basis, the scheduling of each contract within the development programme is not critical. The materials management process for each contract, however, may be sub-divided into three phases which are not clearly defined but rather blend into each other.

**The pre-construction phase**

Once the schedule of quantities is obtained from the Design Engineer, an estimate of costs is provided to the Construction Manager and the Design Engineer for them to calculate the budget for the project in the pre-construction report. A shadow price is determined for the contract and, on the basis of various
factors, a decision is taken as to whether the contract is feasible within the programme. Should the contract be approved, the Materials Manager obtains prices for all items not on his annual tender and provides these to the Construction Manager. The Construction Manager in turn provides the Materials Manager with a list of allowables and the construction programme from which is derived a materials usage programme.

The contract is then tendered for by labour-based contractors and is awarded, and the contractor's details are entered into a computer data-base together with his allowables for the particular contract. The Materials Manager then informs the relevant suppliers of the expected orders and delivery schedules in anticipation of construction.

The construction phase

The materials management during the construction phases revolves around the materials store. The Store Manager monitors the bin levels for all items in the store. Using the lead times provided by the suppliers on their materials tenders and the materials usage programme, the Store Manager maintains the bin levels at an acceptable level. Purchase orders are placed on the suppliers who then deliver the goods according to an agreed schedule.

During the construction stage of the project each contractor provides a requisition note for every item required from the store. This document is authorised by the Construction Manager whereupon the Materials Manager issues a stores issue note and issues the materials requisitioned, provided the quantities remain within the allowables allocated to that contractor. Contractors are permitted, within reason, to return materials not used to the store for which they receive a credit. At the end of every month the Contractor and Construction Manager receive a report from the Materials Manager outlining the items, quantities, unit price, and total value of materials issued to each contractor for the month.

The Materials Manager places purchase orders on suppliers and processes the delivery documentation and invoices, and makes the necessary payments. In Soweto the Materials Manager operates a float account established by the funding agency which enables him to make payments directly to suppliers thereby obtaining the maximum benefit in terms of settlement discounts for prompt payment.

At the end of each month the Materials Manager reconciles the total quantity and value of materials received from each supplier, the quantity and value of materials issued to each contractor, the cost of materials allocated to each funding programme, and all costs involved in the store administration and management. This information is passed to the Project Manager who in turn informs the Client or funding agency who then transfers funds into the Materials Manager's float account.

The post-construction phase

Once construction is completed, and the contract is in the maintenance period, the Materials Manager and Construction Manager reconcile the quantity and value of material used by the contractor. This is then incorporated into the final close-out report which is completed for each contract.

Controls

The systems outlined already include a number of control measures to minimise infidelity and abuse. Some of the other measures that are undertaken are as follows:

- The store maintains a parallel system of recording. A kardex system is employed in the store
together with a computerised data-base, both of which record essential information. The computer system is comprehensive and records all incoming materials including the delivery notes, the details of the supplier, the date on which delivery was taken, the quantity and the purchase price. They also record the requisition note number, the stores issue note number and the contract to which the material was issued and on what date.

- Stock-takes are performed every quarter to monitor shrinkage. Local labour is used to man the store and security is maintained at a strict level at all times. The computer system employs various levels of security clearance allocated to the system users. The clerk who inputs the data, including stock levels, might not have the security clearance to process reports and to examine stock movement.

- Quality control checks are also carried out by the Materials Manager to ensure that material received is consistently adequate in quality.

The systems and control measures ensure that the materials management operation is transparent and open to audit at very short notice.

**Conclusion**

The Contractor Development Programme operates within the concept of labour-based construction. It has as its basis a faith in the ability of people to achieve given the chance to do so. It recognises, however, that many barriers are encountered by the emerging contractor and provides assistance in surmounting these.

Materials management fulfils this function with regard to the procurement of plant and materials for labour-based construction. It combines appropriate systems and controls used by conventional contractors, merchants and municipal storage systems, whilst remaining transparent and accessible to external audit at any time. In this way it serves to protect the interests of the funding agency while providing an essential service to emerging contractors.
Introduction

The Soweto City Council have implemented a programme of labour-based road construction as part of their Contractor Development Programme. The programme is designed to upgrade existing township services using labour-intensive methods and to develop local contractors using a Development Team approach.

Klipspruit Ext 2 was identified as an area needing upgrading (see Fig. 1) and contracts for labour-based road construction have been awarded to local contractors. Van Niekerk, Kleyn and Edwards have been appointed as the Engineer and Grinaker Contractor Development as the Construction Manager for the contracts.

Background

The total length of Soweto's road network is 850 km which includes approximately 550 km of surfaced roads and 300 km of gravel roads.

The Soweto City Council experiences the following problems with the gravel roads in the urban areas:

- The gravel roads are susceptible to surface run off from stormwater during the summer rainy season, which leads to potholes and disintegration of the road surface.
- Uncontrolled stormwater run off from the street surfaces is not drained at low points resulting in the flooding of properties and erosion of roads.
- The gravel roads are difficult to maintain due to their rocky base.
- Erosion gulleys in the road shoulders undercut and progressively collapse the road edges.
- Muddy conditions are experienced during the rainy season and dust problems during dry periods, which results in a rundown appearance to these fully developed urban areas.
- Apart from the high cost of maintenance for the roads the Soweto City Council spends in excess of R2 million per annum in removing silt washed from these roads onto existing surfaced roads and into stormwater drains.

A programme to upgrade the unsurfaced roads through labour-based methods has been implemented as part of the Soweto Contractor Development Programme through the Central Witwatersrand Regional Services Council (CWRSC) Urban Development Programme. Funding is from the Development Bank of South Africa.

The benefits of surfacing the roads can be listed as follows:

- Stormwater control will be improved and this will result in an alleviation of the problem of the flooding of properties experienced by the residents.
- The surfaced roads result in erosion damage being eradicated.
The installation of kerbs as part of the programme prevents ravelling of the road edges and the resultant structural damage that occurs.

- The riding surface is enhanced.
- Dust problems and muddy conditions are overcome.
- There is an immediate and substantial aesthetic improvement of the urban environment.
- Minimal maintenance costs are experienced and road cleaning efficiency is improved which results in great cost savings.
- The road and stormwater construction is labour-intensive and the project offers employment opportunities for the local community.
- Training of labour and small contractors results in a skills transfer.

**Project: Klipsruit Ext 2**

Klipsruit Ext 2 was identified as an area requiring upgrading. Electrical, water, sewer and telephone services have already been installed in the area. The project entails the surfacing of streets, the provision of kerbing to accommodate the flow of stormwater and, where necessary, the installation of underground stormwater drains to allow for efficient runoff. The contracts consist of waterbound macadam asphalt roads and concrete block paving. There is 2594 m of underground concrete stormwater pipeline and 21074 m² of surfacing.

Eight contracts have been awarded to local contractors. The contractor provides labour and small tools and developmental support is offered through the provision of plant, materials, advise, practical assistance and training by a Materials Manager and a Construction Manager.

**Design of roads**

The geometric design consists of 5 m wide residential access roads and a 6 m access collector.

The structural pavement design depends on traffic loading characteristics but may be broadly defined in two categories:

- concrete block paving
- asphalt and water bound macadam with the appropriate layer works (see Fig. 2)

The following materials have been used for the road construction:

Asphalt has been used as it is less susceptible to damage from vehicles and other incidents and has a substantially lower maintenance cost. For a 4 m tarred road the maintenance cost per annum has been estimated at R1,54/m as opposed to a graded road cost of R12,26/m/per annum (Sparks 1994). Minimal patching is needed over a 25 year period after which the minor road generally needs to be resurfaced. Problems have been experienced in obtaining annual maintenance budgets and so capital projects with minimum maintenance are preferred.

- Block paving has been specified for the following reasons:
- The ease of repair that is experienced when service trenches are necessary.
- Concrete block paving is locally manufactured and is labour-intensive in both production and construction.
It is recommended for low speed roads and has a good aesthetic appearance. It also requires minimal maintenance.

Waterbound macadam is a traditional high quality, labour-intensive pavement material and has been shown to employ 10 times more labour than crusher run (Phillips 1992). There is evidence that when properly constructed the materials exhibit higher structural qualities and are less water susceptible than granular materials. Waterbound macadam has been used as a base for all the asphalt surfaced roads.

All excavation for the layer works will be done using labour-intensive methods. Material will be stockpiled and replaced in specified layers. Labour-based methods will be used for the placing, profiling and working of the materials where possible.

Compaction will be done using conventional equipment and layer works are designed according to accepted standards. A stabilised layer will be used where necessary.

Ongoing quality control testing of the materials and layer works will ensure that workmanship meets international standards.

Discussion and conclusions

Some of the project objectives cited in the DBSA appraisal report for the CWRSC Urban Development Programme are as follows:

"To structure and execute construction projects using labour-based technologies and labour-intensive methods in such a manner that through the construction process:

- Employment and entrepreneurial opportunities and created for members of the community.
- The percentage of the construction cost retained by the community is maximised."

It has been estimated that 27 000 man hours of employment will be generated by the 8 projects and that 37% of all expenditure on the project will be retained by the community.

The contracts will achieve the above mentioned objective but also have the following benefits. They will result in a substantial aesthetic improvement of the urban environment, lower maintenance costs than are experienced at present and a greatly improved riding surface.

Stormwater damage will be minimised and skills transfer and employment will have taken place in the community. An asset of value will be created to be enjoyed for the foreseeable future by the community.

The project fulfils the criteria mentioned by Minster J. Naidoo in the RDP information brochure, as a project that meets the basic needs and services of our people while building the economy. It creates jobs, develops skills, addresses affirmative action and targets disadvantaged communities.

References

4.7 Extracts from the National Housing Forum document entitled "The development of small scale enterprises, skills, entrepreneurship and employment opportunities through the provision of housing"

R.B. Watermeyer, Soderlund & Schutte Inc and N.G. Band, Project Management Techniques

Extracts from Part 1 - Section 4

4.3.3 Soweto's Contractor Development Programme: a case study

4.3.3.1 Background

Numerous employment-intensive projects have been undertaken in South Africa with varying degrees of success. Most have been executed as isolated projects, few in terms of a programme. One of the longest running of these projects, and one which has most influenced the direction in which many projects, manuals, guidelines, policies, etc. have been formulated and structured, is that run by the Soweto City Engineer's Department. This project has become known as Soweto's Contractor Development Programme. A particular feature of this programme is that it has been well documented and all the necessary contract documentation (standardised specifications, model forms of agreement, etc.), required to replicate the programme on a national basis, have been developed. As a result, this project will be briefly reviewed.

During the early 1980's, hundreds of millions of Rand were spent in Soweto on services upgrading projects. From an engineering management point of view the project was a huge success, as it was completed on time, within budget and to the correct quality standards. However, from a community point of view it was a dismal failure in that:

- Unemployment levels were the same after construction as they had been before construction.
- Little, or no, transference of skills took place particularly in the commercial, managerial and administrative fields.
- The amount of project expenditure retained within the community was insignificant.

The City Engineer's Department in an attempt to redress this situation, embarked upon a series of experimental projects during 1987 and, based on the lessons learnt, decided that the following policies should be adopted:

- Community-based contractors should be employed to aid community development and productivity.
- Professional management, supervision and training should be used to improve skills and to ensure satisfactory progress on projects.
- Commercial skills, which are an important factor in a contractor's success, should be taught.

A civil engineering project involving the upgrading of approximately two-thirds of the secondary water reticulation of the city was identified as a project suitable for the implementation of a labour-based Contractor Development Programme (CDP). The Soweto City Council's primary objectives in implementing the CDP were to:
● Create employment opportunities for Soweto residents.
● Stimulate the development of competent contractors from amongst the local Soweto population.
● To retain as much as possible of the expenditure within Soweto.

At the outset, it was recognised that no Sowetan either owned, or operated, a civil engineering construction company. It was also recognised that the calling for tenders for the construction of services and structures, albeit by means of labour-based construction methods, from the community would not necessarily result in the production of local contractors. Nor would it elicit any response whatsoever, since the community lacked commercial and managerial skills in addition to the necessary resources. The approach whereby established contractors are required, in terms of the conditions of contract, to engage local sub-contractors, wherever possible, to execute specific aspects of the works was equally considered to be rather meaningless, since this approach assumed that sub-contractors existed within the community. It was therefore decided to develop contractors within Soweto in terms of a programme which could address the barriers to entry which precluded local entrepreneurs from participating in the proposed upgrading project.

The barriers to entry were identified as being:

● Tendering and contractual requirements, such as the provision of sureties, the inclusion of penalty clauses and the tendering of rates.
● The prevalence of plant-based construction practices.
● The lack of financial resources to purchase materials, hire plant and tools and to pay wages.
● The lack of credibility in commercial circles.
● The lack of commercial, managerial and administrative skills.
● The lack of technical competence.

To address these barriers to entry, it was recognised that changes in the construction methods had to go much further than merely substituting men for machines, as technologies had to be altered to render the construction process appropriate for manual construction methods, using relatively, unskilled workers. In addition, the very construction process had to be changed to eliminate the remaining barriers to entry which faced local entrepreneurs. Technical, managerial, commercial and administrative skills had to be taught as an integral part of the process, the requirement for sureties had to be waived, access to reliable sources of materials and plant had to be provided, and finance for wages, etc., had to be made available. In short, resources had to be provided and developmental support furnished.

4.3.3.2 Structure of developmental support and contracts

The consulting engineer who set up the Ilinge project in the Transkei, where small contractors were established to construct the works, was appointed to initiate the project in 1988. Today, a development team (see 4.4.6), comprising a number of firms of consulting engineers and a large firm of well established civil engineering contractors, provide the necessary support to emerging contractors as illustrated in Figure 4.1. The team, apart from providing conventional consulting services, advises, trains and assists local community-based contractors in the administration and execution of their contracts; procures, supplies, issues and delivers materials to the various construction sites; and arranges fortnightly payments. At the same time, the development team employs and trains members of the local community to run stores facilities, monitor progress, assist with administration, etc.
The contractor enters into a contract directly with the employer. The development team, on the other hand, is separately appointed by the employer on a fee basis. Thus the development team may be regarded as construction facilitators who arrange for the provision of resources that the contractor lacks. The ownership of the contract, however, remains with the community-based contractor.1,3

The CDP apart from addressing the Council's objectives, affords members of the community the opportunity to participate in various levels and capacities in construction activities, i.e., as labourers, semi-skilled workers, skilled workers, foremen, contractors, storemen, inspectors, clerks, transporters, etc. The programme envisages 5 levels of contract, full details of which may be found in section 4.4 of part II. These are:

- Level 1: labour only
- Level 2: labour plus transport of materials to site
- Level 3: labour plus transport plus materials (assisted)
- Level 4: labour plus transport plus materials (unassisted)
- Level 5: labour plus transport plus materials plus full surety

Training of community-based contractors begins when tenders are advertised. Prospective tenderers may attend pre-tender classes where tender procedures are explained. Upon the award of a contract, an initial mentorship and technical training period commences, during which contractors learn to organise work groups, ensure that productivity targets are met, develop communication skills, carry out payment procedures, etc., in addition to learning the technical aspects of the work.1,6

Training is, predominantly on-the-job with infrequent, formal after-hours training sessions. Members of the community are, therefore, trained on an "earn and learn" basis, the cost of which is nominal and forms part of the construction cost. However, a formal training phase is also provided to ensure that budding contractors are able to fend for themselves in the open market.1,3

Since the objective of the Council was as much to train local contractors as to provide work for the community, it was decided to use the Standard General Conditions of Contract for Works of Civil Engineering Construction as the basis of the agreement between the labour-based contractor and the Council. Accordingly, contracts were prepared strictly in accordance with part 1 of SABS 0120. The main features of the contracts at the lowest level of contract are:

- Tenderers may price the schedules of quantities, or may, subject to certain conditions, submit lump-sum prices.
- The Contractor is not required to furnish a surety.
- The Council arranges for all necessary insurances except Workmen's Compensation insurance.
- The Contractor is assisted in all aspects of the contract and is trained by a Construction Manager appointed by the Employer.
- The Council supplies and delivers to the site all materials and plant required through his appointed Construction Manager.
- The Contractor supplies, supervises and pays all labour required to execute the contract.
- The Contractor supplies all minor hand tools.
- The Construction Manager arranges for specialist work, e.g., blasting, to be carried out.
- The Contractor is required to remedy defects for 6 months after completion of the works.
After the first year, the documentation was reviewed and substantially revised. Preliminary and general items were introduced. The Contractor was given greater responsibility in the testing of backfill and pipelines, and was required to provide all small tools. The roles of the Construction and Materials Managers and the Engineer were more clearly defined and the specifications were totally revised. Standardised specifications for labour-based construction, based on the principles contained in SABS 0120,19 were prepared, as it was found that the plant-based SABS 1200 specifications20 were in many respects neither practical nor relevant. At the same time construction manuals were prepared to supplement the performance-orientated standardised specifications.1,6

The sizes of contracts are such that the contract duration is usually between 3 and 6 months and several contracts run concurrently. A single development team can comfortably support between 8 and 10 contracts running simultaneously. Should any contract be determined, the outstanding work can be readily executed under concurrent contracts.

4.3.3.3 An analysis of the project

Between August, 1988, and January 1994, 87 Level 1 and 9 Level 2 contracts were awarded. Of these, only eight contractors involving five contractors were determined, due to unsatisfactory performance, and almost all of those during the first two years of the project. In most instances the failure of the contractors could be directly ascribed to inexperience on the part of the management team. Some 30 contractors have successfully completed contracts and it is now not uncommon to receive in excess of 30 tenders for a single construction contract. There is great enthusiasm for the scheme and productivity on the contracts has been high. Most contractors appear to have made satisfactory profits.

The funding of the programme by the CWRSC has been somewhat erratic as the annual provision of funds has, for the past few years, been subject to severe cuts owing to funds having had to be rescheduled, as a result of rent and service charge boycotts. This has meant that the programme as at the end of January 1994, had not advanced beyond Level 2 contracts. Nevertheless, at the end of January 1994, just over R42 million had been spent on the upgrading of the water supply system and some R2.6 million on the construction of residential roads, mainly using waterbound macadam base courses. Approximately 215 km of secondary water mains have been laid, 19 500 erven have been replumbed and 30 000 m2 of roads have been surfaced. Recently, a R30.5 million Rand loan agreement between the CWRSC and DBSA has been concluded to finance the programme during the 1993/94 financial year.

An analysis of CDP projects has revealed that:

- Community-based construction is cost comparable with conventional construction and, in some instances, is significantly more economical.
- The portion of expenditure retained within the community, expressed as a percentage of total expenditure, depends on the type of service installed. Typically this figure lies between 30% and 65%.
- The number of people employed on the programme can be significant. (The project has peaked with employment levels of about 900 people.)
- The project, as a whole, can be effectively accelerated, or decelerated, by varying the number of
contracts awarded and the sizes of the management teams.

The development support structure employed in the CDP in Soweto has ensured that projects are being completed on time, to the required quality and at a cost which, on average, is no higher than that of conventional construction. At the same time, the support structures have ensured that the objectives of the CDP are being met, i.e., local entrepreneurs are being trained as contractors; commercial, technical, administrative and managerial skills are being taught; employment opportunities for local residents are being created and a significant proportion of the project expenditure is being retained by, and recycled within, the community.
Figure 1: KENYA RURAL ACCESS PROGRAMME
ACCUMULATED LENGTH OF ROAD
Figure 1: Approaches to Implementation
Civil and electrical works

Figure 2: Approaches to facilitate a community’s involvement in construction projects
Figure 3: A Contractor Development Programme for Civil and Electrical Contractors