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Title: **Employment Creation in Construction in South Africa: The Potential and the Problems.**

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INTRODUCTION

Unemployment is one of South Africa's most pressing problems. Various solutions to this problem have been proposed. Elsewhere in Africa employment creation programmes have been established within the public sector; in particular, rural roads have been constructed and maintained by labour-intensive methods. Per unit of expenditure labour-intensive methods create *significantly* more employment than conventional methods of construction. Labour-intensive methods are economically efficient and result in as high a standard of construction as the level of funding will allow.

In South Africa, there is a widely acknowledged need for housing and municipal infrastructure (water supply, sewerage, streets, storm water drainage, electricity, refuse collection). While the emphasis is generally upon urban or peri-urban conditions, there is also a need for physical infrastructure in the rural areas. From a theoretical perspective, supported by experience elsewhere in Africa, there are reasons for considering that properly constituted employment creation programmes, based on labour-intensive methods, could be established to construct and maintain the required physical infrastructure.

From 1975 to 1987 the author was involved in employment creation projects and programmes in Iran, Botswana and Kenya. Based on research and practical experience the author has proposed a strategy to achieve employment creation in construction. Since his return to South Africa in September 1987, he has been involved both in debate about the subject and in various employment creation projects. Several difficulties have been experienced. Lessons have been learned which could be useful for future programmes.

Following a summary of the main tenets of labour-intensive construction and a brief description of progress elsewhere in Africa, this paper outlines the potential contribution which employment creation programmes could make to alleviating the unemployment problem and a strategy for achieving results. The paper then describes the problems that have been experienced or observed in South Africa in relation to employment creation construction projects. This highlights various issues which require attention. Evidence from the discussion of the problem areas will then be used to criticise two current projects that claim to be using labour-intensive methods. The paper closes with some recommendations for the future. Throughout the paper there are aspects which require research to attain greater clarity.

Before dealing with the potential and the problems of employment creation in construction several issues related to the unemployment problem in South Africa will be discussed: its extent and deleterious side

effects; some of the current proposals to solve unemployment; some local and international experience regarding programmes to solve unemployment.

UNEMPLOYMENT

The level of unemployment is difficult to delineate accurately because people are employed in both the formal and informal sectors of the economy and reasonable statistics only exist for the formal sector. Using unpublished data Kritzinger-Van Niekerk recently showed that the estimated percentage of people without formal jobs rose from 33,5% in 1974 to 51,3% in 1990.

Year	De facto Labour Force	Formal Employment Opportunities		People Without Formal Employment Opportunities	
		No.	%	No.	%
1960	6 901 000	4 652 000	67,4	2 249 000	32,6
1974	10 236 000	6 809 000	66,5	3 427 000	33,5
1990	16 340 000	7 953 000	48,7	8 370 000	51,3

Manipulating the same data Kritzinger-Van Niekerk also showed that between 1960 and 1965 the formal sector had been able to absorb 80,9% of the annual net additions to the labour force; between 1986 and 1990 this had shrunk to 8,4% (Kritzinger-Van Niekerk, 1991).

Using data on the formal and informal sectors from unpublished population census information it was estimated that unemployment grew from 7,2% in 1980 to 13,2% in 1989 (Ligthelm and Kritzinger-Van Niekerk, 1990). The levels of unemployment vary significantly from region to region: 10,8% in the Cape Peninsular to an average of 29% in the "homelands" (Kritzinger-Van Niekerk, 1991). Even these figures do not quite capture the severity of unemployment on a disaggregated basis. Estimates of unemployment rates in some settlements vary from 36 to 60% (Reilly, 1989; Fourie, 1988; Odensk-Duke, 1990(a)). While it might be difficult to define the exact level of unemployment there is no doubt that it has increased dramatically over the past thirty years.

Not only has the level of unemployment increased but the economy has become more capital-intensive. Kritzinger-Van Niekerk reports that for the period 1971-1980 one per cent annual economic growth resulted in 0,64% growth in employment; between 1981 and 1990 one per cent annual economic growth only resulted in 0,46% growth in employment; for the period 1986 to 1990 the latter had shrunk to 0,30. The drop in this percentage - by more than a quarter during the 1980's as a whole and by a half for the period 1986 to 1990 - indicates the extent to which the economy is becoming more capital-intensive. Similar opinions have been expressed by the Bureau for Economic Research (Steyn, 1990). Between 1986 and 1990, for any additional expenditure less than half the additional employment was created

than during the period 1971-80. In this respect Ligthelm and Kritzinger-Van Niekerk concluded: "Thus unemployment in South Africa has increasingly assumed structural features implying it is related not only to the level but also to the pattern of economic activity in the country."

Although the actual level of unemployment is debatable, a survey to determine the most severe problem areas in South African society found that all the four population groups (as then defined) identified unemployment as "the foremost problem field" (Whittle, 1990, quoted in Ligthelm and Kritzinger-Van Niekerk, 1990). This has been reflected at some political levels. One of the first items of the ANC's Development Policy is "job creation" (ANC, 1990). While there are political roots to violence it is exacerbated by the high level of unemployment. Other commentators have given searing accounts of the deleterious effects on individuals of being unemployed (Ramphele and Wilson, 1989). The combination of unemployment and violence has led to extreme levels of stress (Odensk-Duke, 1990(a) and (b)). Even if AIDs has the impact projected by some there will still be at least ten years in which the levels of unemployment will remain extremely high.

RESPONSES

Several opinions have been expressed regarding solving the unemployment problem. These have included:

(i) Growth in the whole economy with particular emphasis upon export orientation.
(ii) Encouragement of small businesses.
(iii) Decentralisation.
(iv) Growth in the informal sector.

The author is not equipped to discuss adequately the merits and demerits of each of these responses. However, following these routes the creation of employment will only take place when the whole economy begins to expand. The South African economy is not expanding. From a growth rate of 5,8% in the 1960s and 2,9% in the 1970s the growth rate fell to 1,4% during the 1980s, with a negative growth rate for 1990. And it was shown above that during the period 1981 to 1990 less employment was created per unit of expenditure than during the period 1971 to 1980.

While undoubtedly one must look to the growth of the whole economy to solve the unemployment problem, at present as the economy is not expanding one should also look to ways of creating employment within the existing economy. This does not imply that major emphasis should not be placed upon policies to expand the economy as a whole; simply that additional policies are required to re-structure current activities so as to create greater employment opportunities within existing budgetary constraints. Such

policies were pursued in South Africa and the USA during the Great Depression. During the 1970s and 1980s at least one UN agency, the International Labour Organisation, has been active in this field.

During the 1920s and 1930s public sector programmes of one kind or another were used in order to alleviate the "poor white" problem (Abedian and Standish, 1985; 1986). In 1989 Ramphele and Wilson argued that public works programmes would be necessary to relieve present unemployment (Wilson and Rampheli, 1989). Recently, COSATU convened a seminar on "One Million Jobs by 1992". The purpose of the seminar was to review experience and opinions about public works programmes and to develop a strategy for the future. Papers presented at the seminar included "Job Creation Schemes in the United States in the Depression" (Nicol, 1991), "International Job Creation Schemes" (Trade Union Research Project (TURP), August 1991), "Information on Public Works Programs in South Africa" (TURP, July 1991), "Public Works Programme in South Africa" (Kritzinger-Van Niekerk, 1991) and the author gave a presentation on the issues to consider when planning a public works programme.

The seminar provided a very useful background to the subject. Here the author wishes to draw attention to two sets of conclusions that were reached in different papers. Based on Abedian and Standish's report for the Human Sciences Research Council (Abedian and Standish, 1989), the Trade Union Research Project reported that the most prevalent causes of failure of public works programmes were:

- they were seldom scaled to the magnitude of national manpower needs;
- they were often introduced in a fragmented and unsystematic way;
- they used inappropriate technology;
- they were introduced on an *ad hoc* basis and were not linked to an overall development policy;
- they had also failed because of the lack of administrative back-up;
- there had been inadequate post project maintenance;
- they were almost entirely dependent upon the government's commitment to the programme: if there was a lack of commitment this would be reflected in a lack of funding.

In their review of international special public works programmes, the Trade Union Research Project concluded that there were certain problems, these included:

- the conflict between sufficient planning and the need to start a programme quickly and use donor investment funds speedily: a programming stage of six months should be introduced;
- local institutions often have difficulty in taking responsibility for execution of the projects: governments must allocate adequate human resources to the projects;

- there is often not enough active participation by local beneficiaries.

It is also worth stressing the proportion of government expenditures which have been devoted to public (relief) works programmes in the past. According to Abedian and Standish (1985) between 1920 and 1940 the proportion of government expenditure on unemployment relief measures varied from 0,6% in 1920 to 15,8% in 1935; in only the first two years, 1920 and 1921, was the proportion lower than 1,7%. In the case of the USA it has been reported elsewhere that:

> Unemployment relief, aid to agriculture and public works designed to promote employment together account for $26.0 billions, or nearly 50 per cent of the total federal expenditures in 1934-40.
>
> (Hansen, 1941: 124)

A major conclusion that the author has reached about the vast majority of public sector job creation schemes elsewhere in the world is that they have generally concentrated upon "job creation" with little concern for either the quality of the product or the economic efficiency of the work. (As we will see the same has been true for similar programmes in South Africa.) In most emergency job creation schemes there has been no interest in the quality of the product and little concern for the economic efficiency of the work. In relation to the South African government's efforts to solve the poor white problem during the 1920s and 1930s Abedian and Standish (1985) have quoted a 1920/1 Forestry Department report which exemplifies the extent to which these programmes operated inefficiently:

> The cost of these settlements proved to be very high indeed ... The costly nature of the work hardly justified the settlements from the economic and purely forestry point of view, but from the social standpoint the Department of White Labour is well satisfied.

More recent examples will be mentioned below.

This tendency to concentrate on employment creation at the expense of concern for the quality and cost of the product may be seen within a UN agency. In 1969 the International Labour Organisation (ILO) established its World Employment Programme. Within this programme there were two divisions: Special Public Works, and Technology and Employment. The former was a much larger operation than the latter. Special Public Works devoted its energies to emergency job creation, while Technology and Employment concentrated upon the production of a good product by methods that employed as many people as possible in an economically efficient manner. Over the years there was increasing dissatisfaction with the lack of quality and high cost of the Special Public Works Programmes. In 1987 the two divisions were amalgamated so that the dual perspective of the Technology and Employment Branch could be brought to bear on the ILO's much larger Special Public Works division.

Much of the author's experience was derived from his association with the Technology and Employment Branch. Through this work he became

convinced that the use of labour-intensive methods during the construction of infrastructure was economically efficient and could alleviate unemployment. However, this can only be achieved with the adoption of a dual perspective that lays as much emphasis upon the product as upon employment. In the following section a summary will be given of the theoretical principles on which this approach is based and the work carried out in Africa.

THE POTENTIAL FOR EMPLOYMENT IN CONSTRUCTION: THEORY AND PRACTICE OF LABOUR-INTENSIVE CONSTRUCTION

During the 20th Century civil construction in industrialised countries became highly capital-intensive. Conventionally the bulk of civil construction is carried out using heavy equipment and only a small proportion of the total costs are devoted to labour (about 10% for a typical road project). During the 1970s and 1980s extensive research was carried out by the World Bank and the International Labour Organisation to explore the possibilities of employment creation within economies that were neither industrialised nor expanding. The research concentrated upon civil construction (physical infrastructure such as roads, dams, buildings) for three reasons:

(i) Civil construction accounted for 50-70% of Gross Fixed Capital Formation (Gross Fixed Investment) i.e. civil construction was important in the development process as it produced the infrastructure required for other investment to prosper;

(ii) 60-70% of civil construction took place within the public sector and might, therefore, be amenable to public sector control;

(iii) 50% of civil construction consisted of earthworks which comprised the following operations: excavation, load, haul, unload, spread (ELHUS). ELHUS operations could be carried out by labour-intensive methods as opposed to conventional equipment-intensive methods which were merely magnified versions of hand-tools. Because earthworks comprise such a large proportion of road construction (and road construction comprises about half of all civil construction) if labour could be substituted for equipment then there was an opportunity for employment creation within economies that were not expanding rapidly.

There is an extensive literature on the subject to which the author has contributed and summarised elsewhere (McCutcheon, November 1990). For the purposes of this paper only a few central issues will be sketched. The first two phases of the research revealed that it was technically feasible to substitute labour for equipment in civil construction and, under certain

circumstances, it was economically efficient to do so. In 1986 the World Bank concluded:

> Wherever the basic wage actually paid ... is less than ... about US $4,00 per day in 1982 prices, and labour is available in adequate quantities, the alternative of using labour-intensive techniques should be seriously considered (World Bank, 1986).

Four dollars in 1982 translates to between R27 and R38 in 1991 depending upon various assumptions.

Economic efficiency was achieved through:

(i) proper analysis of the project and the methods of work used;

(ii) training of the supervisors;

(iii) good conditions of employment and the structuring of incentives;

(iv) good organisation and management;

(v) the use of appropriate good quality tools;

(vi) proper nutrition.

From this research the following view emerged: employment creation in construction may be achieved through the use of labour-intensive methods of construction. 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 specification and allowed by the funding available. Employment creation programmes based on the principles of labour-intensive work aim at devoting as high a proportion of programme costs to unskilled and semi-skilled labour without jeopardizing the required technical standard of the product. Value for money is achieved by the intensive use of labour often using innovative techniques of work, motivation and control. Labour-intensive construction is the effective substitution of labour for equipment. This substitution results in a quantum leap in the amount of labourers required for civil construction.

The third phase of the research concentrated upon single-site, later multi-site, exploration of the viability of the approach particularly in relation to rural road construction. Over the past 17 years labour-intensive road construction has progressed from being a hypothetical possibility to a practical reality (Coukis et al., 1983). National programmes have been established in Kenya (de Veen, 1980), Botswana (McCutcheon, 1983; August 1988(a); May 1991), Lesotho (Hagen, 1986), Malawi (Hagen and Relf, 1988) and Mozambique (Boardman, 1984)*. Several pilot projects are underway in Ethiopia, The Gambia, Ghana, Tanzania and Zambia.

In Kenya, over 8 000 kilometres (kms) of rural access roads have been constructed and over 80 000 years of employment have been created. The

*Now discontinued because of the war.

Kenyan Rural Access Roads Programme is the overall responsibility of the Ministry of Transport and Communications but operates within the national District Focus policy which gives great autonomy to the local level. The methods have been considered so successful that they have been introduced in the secondary roads network (the Minor Roads Programme). In Botswana a national programme of labour-intensive road construction units has been set up within District Councils which are semi-autonomous bodies under the overall responsibility of the Ministry of Local Government and Lands. This programme has resulted in the creation of over 3 000 jobs (total employment within the public sector is only 20 000) and the construction and upgrading of nearly 2 000 kms of road. In Malawi the programme is part of the Ministry of Works and Supply. Since it inception over 3 845 kms of district road have been upgraded in 16 of the country's 24 districts. In Lesotho the Labour Construction Unit has been attached to the Ministry of Works since 1977. By 1985 about US $3 350 000 had been expended on various construction works.

Thus, 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 17 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 one to fifty vehicles per day; standards varying from spot-improvement to engineered gravel roads and haulage varying from tipper truck to donkey cart - the latter being used in relation to the engineered earth roads. These methods of work have been carried out within institutional frameworks that 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.

In the early phases the emphasis was upon the creation of employment opportunities for unskilled labour. Over the past decade it has become clear that in order to use labour productively it is necessary to train a skilled supervisor who is technically and organisationally competent and thus able to direct and motivate the workers under his or her control. (In Kenya the ratio of labourers to site-supervisors is about 70 to 1; in Botswana it is about 20 to 1.) Equally, for a successful national programme it is necessary to educate engineers about employment creation and train them in the specific skills required for the planning, control and evaluation of large labour-intensive programmes (to date the ratio is about one engineer per 300 labourers; in time an experienced technician or technologist should be able to do this level of work releasing the engineer for engineering and planning).

The author considers that the main reasons for the success of the programmes in Kenya and Botswana are as follows:

(i) Good preliminary analytical work and thorough attention to technical aspects throughout the work;

(ii) Pilot projects which tested all aspects (technical, administrative, organisational, institutional, wage rates and conditions of employment, training, planning, socio-economic\community) and acted as the embryonic training programme for future work;

(iii) Strong organisations/institutions with good management systems: yet flexible;

(iv) Extensive training;

(v) Long-term political support;

(vi) Long-term financial commitment;

(vii) Good long-term co-ordination and objective external advice;

(viii) Consensus reached with regard to: wage rates, conditions of employment, role and responsibilities of the community.

(McCutcheon, November 1990)

IMPLICATIONS FOR SOUTH AFRICA

Most of the above experience has been achieved in relation to the construction and maintenance of low-cost low-volume rural roads. On his return to South Africa the author explored the extent to which the success of the programmes in Kenya and Botswana could be replicated in South Africa. The author initially assumed that replication would only be feasible in rural areas because of the ostensible differences between South Africa and the other two countries; in particular (i) South Africa was far more industrialised and thus heavy equipment was readily available together with the operation and maintenance systems for achieving high productivity and (ii) the complex nature of political and labour relations (McCutcheon, August 1988(b)). Subsequent experience with conditions in South Africa has led the author to conclude that labour-intensive methods should be viable on a much wider scale and for other sub-sectors besides rural road construction. On the one hand the dislocation between the industrialised portions of South Africa and the remainder of the country is so great that it should be possible for labour-intensive methods to be economically efficient for much urban road construction. On the other hand, in relation to the provision of municipal infrastructure (streets, water supply, sewerage and stormwater drainage) in Ilinge (Transkei) and Soweto, significant pathbreaking progress has been made and documented by the consulting firm Croswell, Shepherd and Partners (Croswell, 1986; 1989). Furthermore, one contractor has reported success in using labour-intensive methods (Loots, 1989).

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 (McCutcheon, March 1989). 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 numbers 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.

Although research would be required to determine the number of employment opportunities that could be created, the author proposed that a strategy should be adopted in order to increase the greater use of local resources, particularly labour, in the construction industry. This strategy was based upon the experience and research outlined earlier in the paper:

(i) The adoption of a long term (+ 10 years) national perspective.

(ii) The identification of the type of work which could incorporate greater use of local resources.

(iii) Analysis of the extent to which local resources might be used within the types of work identified in (ii).

(iv) The need for a "programme" approach: firstly, achieve consensus amongst the various parties involved as to the concepts involved and overall objectives; secondly, detailed analysis of all aspects of the proposed work; thirdly, initiate a small pilot project which would also be the embryonic training programme, concurrently carry out further analytical and forward planning work and fourthly embark upon soundly structured national programmes.

(v) Educate all involved in this work about the concepts and means for achieving the objectives.

More details of the proposed strategy have been provided elsewhere (McCutcheon, February 1991).

With one exception there has been little progress in relation to the implementation of the proposed strategy. The remainder of the paper will outline the difficulties that have been experienced in relation to the initiation and implementation of employment creation in construction in South Africa.

intensive methods but the cost of the works would then be 20% higher than using conventional methods. However, the decision to actually make use of labour-intensive methods was taken *after* the design has been completed. At this stage the Engineer attempted to influence the construction methods used by the prospective contractors.

Several statements and instructions specifying the use of labour-intensive methods were scattered throughout the tender documents, viz:

(i) A clause in the Special Conditions of Contract emphasized the "importance of using economically viable labour-intensive methods of construction wherever possible";

(ii) A clause in the specification stated that "Preference will be given to tenders which provide for the use, wherever feasible of labour-intensive construction methods". The clause also listed work and operations that should be considered for labour-intensive work, e.g. clearing, gribbing, removal of trees, hard excavation, spreading backfill, pipe laying, etc.

(iii) A direction to the Tenderer to price the Schedule of Quantities on the basis of methods normally used by his firm but that "special consideration will be given to firms who offer labour-intensive methods wherever possible";

(iv) A schedule in which the Tenderer was required to detail all work normally carried out by labour-intensive methods at billed rates;

(v) A schedule in which the Tenderer was required to detail activities normally carried out with equipment but which could alternatively be undertaken by hand labour, together with the time and cost implications of the use of hand labour;

(vi) A schedule of rates was required for the hire of plant and a schedule listing plant which would be made available for the contract.

Although there appear to be several points at which the Engineer was attempting to foster the use of labour-intensive methods, the construction specification was based strictly upon the conventional specifications which are related to the use of equipment (SABS 1200 DB Earthworks (Pipelines) and LB Pipe Bedding). No provisions were omitted, altered or included to facilitate the use of labour-intensive methods. Furthermore, despite the Engineer's avowed commitment to the greater use of labour-intensive methods phrases like "wherever possible" and "wherever feasible" did not compel the Tenderer to use labour-intensive methods. The inclusion of another schedule requiring "details of operations normally done with equipment but which could be carried out by labour if instructed to do so" acknowledged the Engineer's belief that labour would be more costly and time-consuming than plant. The list of plant and plant-hire rates contradicted the intention to promote labour-intensive methods.

PROBLEMS EXPERIENCED IN RELATION TO EMPLOYMENT CREATION IN CONSTRUCTION

In relation to employment creation in construction several organisations and institutions are debating the issues, developing policies and implementing projects. These include:

(i) The Development Bank of Southern Africa;
(ii) Institutions within Kwazulu, Transkei and Venda;
(iii) COSATU;
(iv) The government;
(v) Old Mutual-Nedcor;
(vi) Soweto City Engineer's Department
(vii) Urban Foundation.
(viii) The Independent Development Trust

The author has been directly involved in various projects in which employment creation has been a major focus. He has also been involved to a lesser degree in other projects or initiatives. Through these activities he has become acquainted with other projects and has been able to observe progress. Under these three different categories of involvement, the following table lists the projects and the responsible organisation:

1. DIRECT INVOLVEMENT (EXTENSIVE)

Project/Programme	Organisation
Transkei Rural Road Network	Transkei/DBSA
Kwazulu Tribal Roads Maintenance Study	Kwazulu/DBSA
Xolo Road	Kwazulu/DBSA
Programme of Labour-based Construction Assignment Projects	DBSA
Mohlaletsi Sekhukhuneland	Department of History University of the Witwatersrand, Donaldson Trust

2. DIRECT INVOLVEMENT (LIMITED)

"Towards 1 million Jobs"	COSATU
Imbali Rehabilitation	Joint Working Committee
Gini Upgrading	Urban Foundation
Venda Tribal Roads Maintenance	Venda/DBSA
Upgrading of Primary Teacher Training Colleges Transkei	Transkei/DBSA
Department of Transport	Civil Engineering Advisory Committee

3. OTHER PROJECTS

Upgrading of Secondary Water Mains in Soweto	Soweto/Croswell
Ilinge Upgrading	Ilinge/Croswell
Etwatwa Stormwater	Daveyton/BKS
Bridges in Bophuthatswana	BOP/Jeffares & Green
Mkomazi Bridge	Kwazulu/DBSA
Macubeni Dam	Transkei
T.A.T.U. Roads	T.A.T.U. Transkei
Thokoza Road	Valley Trust

Particularly through direct involvement but also from observation of other work, the author has identified several problem areas associated with employment creation in construction. However, before discussion of the problem areas it is necessary to describe the most common process that has been traditionally followed in the provision of construction infrastructure. Without an understanding of the conventional construction process it would be difficult to appreciate what is entailed in attempting to alter the components of such a process.

The conventional process involves three distinct parties. The client (public sector authority or private company) decides that something must be built. The client is formally referred to as the Employer. The Employer appoints a consulting engineer (the Engineer) to design the work and prepare the contract documents covering the construction work. Once the design has been completed and the contract documentation prepared the work is put out to tender. Contractors submit their tenders. The contract is awarded to the contractor who submits the lowest tender. The contractor constructs the works. The work of the contractor is usually checked by the consultant (the Engineer) who designed the works.

The Client may be public sector or private. In most countries the public sector is Client for approximately 60-70% of all civil engineering work. The function of the Engineer may be carried out "in-house" (i.e. within the client organisation whether public or private) or by a separate consulting engineering firm; whichever, the Engineer is still required to be competent as to design and impartial with respect to supervision of construction works. The works themselves may be constructed by an "in-house" capacity (termed departmental work or force account) or separate contracting companies. In recent years the balance of work between departmental and contracting companies has been about 30:70 (Lagaay, 1989).

While there are several circumstances under which different procedures are followed the above is the most common, particularly in relation to the provision of civil infrastructure. The first point to make is the number of different organisations involved in the process and, therefore, if one

wishes to initiate something out of the ordinary, one has to persuade people in different organisations to see things differently. The second is that, if one wishes to initiate something different it begins with the client.

Thirdly, over the past thirty years civil construction has been based upon the use of equipment. Clients have certain expectations as to the type of product they require and the methods by which these will be provided. Consultants have developed designs which make optimum use of equipment and the specifications for testing quality of results are also equipment based; similarly for the contract documentation. Consultants tend to specialise in designing certain types of work. They are able to make a living by the modification of earlier work. The fee structure is laid down by the South African Association of Consulting Engineers. As long as any new work is merely a modification of earlier work the consultants can survive. However, if there is a significant difference in the new work then the existing fee structure does not cover the time and effort required to investigate the technical requirements, design accordingly and produce appropriate contract documentation (Cohen, 1989). Equally, the contractor has developed systems based upon the use of equipment. On the one hand he has the skilled human resources to manage and operate this equipment. On the other, he is able to assess the time, cost and technical implications of the new work for which he has been asked to tender. These aspects will be dealt with in much greater detail below.

The outline of the construction process has been provided because it will be necessary to make reference to it when discussing problems. It should also have indicated that the construction of civil infrastructure is a process requiring the co-operation of different parties each of whom has different priorities. To achieve a fundamental change in the way things are done requires much more than a measure of common understanding on the part of the different parties. In relation to a significantly greater use of labour in the construction process it is necessary that the client understands that he will get the same quality of product for the same cost, within the same time frame as could be achieved using equipment. The consultant must be able to develop designs and contract documentation appropriate to the greater use of labour and have mechanisms for checking the results. The contractor must have the human resources (skilled supervisors) and management systems for implementation.

As mentioned above the construction process is based upon the use of equipment. A corollary is that it is *not* based upon the extensive use of labour. To incorporate a significant increase in the use of labour requires a complete revision of the components of the construction process from conception through design and specification to construction itself.

This would include the necessary training of the engineering and supervisory personnel.

Turning now to the problem areas identified during the past four years, these will be dealt with under several headings:

1. Overall misconceptions.
2. Emergency job creation projects.
3. The Contractor.
4. Analysis and Design.
5. Lead-in time (Consensus/start-up phase).
6. Long-term perspective.
7. "Programme" Approach.
8. Community.
9. Small Contractors and the Public Sector.
10. Wages, Conditions of Service and Trades Unions.

1. Overall Misconceptions

Clients, consulting engineers, contractors, donors, officials and community representatives are usually extremely sceptical as to the practicality of this type of work with respect to time, cost, quality and organisation. It is generally contended that labour-intensive methods would be more costly, take longer and result in a lower quality of product than could be achieved using equipment; organization of the work force would be far more difficult, especially with the current level of conflict. Discussions reveal psychological dimensions: engineers and client officials dislike labour-intensive methods because they are not modern and because they are perceived as being primitive and backward. In turn community representatives think that the use of such "third class" methods must mean that a third class product is being foisted upon them. These misconceptions were experienced by the author throughout his work in Iran, Botswana and Kenya. The same set of misconceptions has been identified in South Africa by James Croswell who calls them 'lies' (Croswell, 1989).

The research and practical work carried out elsewhere challenge each of these misconceptions: as discussed above, labour-intensive construction results in the same quality of product at an economically efficient cost (see above pages 6 and 7). The international experience has been substantiated during the provision of municipal infrastructure in South Africa (Croswell, 1986; 1990). Despite the evidence to the contrary it would be fair to say that most engineers remain sceptical as to time, cost, quality and labour relations. Labour-intensive construction is still regarded as heretical by the civil engineering industry. These misconceptions, taken together with a lack of understanding of the

construction process, are probably a major source of most of the problems areas which are discussed below.

2. Emergency Job Creation

Perhaps the most serious consequence of the misconceptions is the common perception that the greater use of labour could only be sensible in relation to emergency job creation projects. The belief that the greater use of labour automatically implies greater cost, longer construction times, lower quality and difficulties with the management of labour means that those involved in emergency job creation projects have low expectations which are indeed mirrored by results.

However, to the layman the methods used during emergency job creation projects are ostensibly the same as labour-intensive methods: predominantly individuals using hand tools. It is not understood that individuals milling around without any visible order or engineering is NOT labour-intensive construction: to the contrary most emergency job creation projects are labour-extensive with little to show in the way of product. But the misconceptions lead to principles of analysis, planning and engineering being ignored. It is worth dealing with the most recent local example of this in greater detail.

The Special Employment Creation Programme (SECP) was initiated in 1985. The objective of the SECP was "to provide temporary relief to the unemployed but to refrain from giving them handouts, and to deploy them as productively as possible". From April 1985 to June 1990 R719 million was spent on the SECP. In addition a Training Programme was attached to the SECP; from the initiation of the programme in 1985 until June 1990 R423 million was spent on training (in building skills *not* civil construction)

In 1987 the Development Bank of Southern Africa evaluated the early stages of the SECP (Viljoen et al., 1987). It reported that up to March 1986 297 867 people had been employed in temporary jobs. In its assessment it noted that:

- the SECP was of too short a duration and the amount of money too small to make any significant impact;
- in some cases supervision and administration was difficult which led to poor productivity;
- there was a lack of clarity;
- project identification was haphazard;
- there were time lags in cash payments to institutions.

The development of the SECP since 1986 has not yet been systematically evaluated, however a DBSA commentator recently reported that both short-term temporary projects and longer term projects had been incorporated into the SECP since 1985 (Kritzinger-Van Niekerk, 1991). The results of the

SECP were held to correlate with international experience; for projects with short-term and temporary results:

- no permanent employment opportunities were created;
- no physical and social infrastructural assets were created;
- projects were not fully integrated with 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.

Projects with a long-term and permanent nature had contributed to the creation of permanent employment opportunities and physical and social infrastructure.

No evidence was provided of the balance of expenditure between the short-term and permanent aspects of the programme. Neither was any evidence provided to indicate that, even in the permanent projects, per unit of expenditure more employment had been created than would conventionally have been the case. (From the arguments presented in this paper the author suspects this to have been improbable.) Nonetheless Kritzinger-Van Niekerk derived one important lesson from the analysis of the SECP from 1985 to 1990:

> the scarce management and financial resources of the public sector could be inefficiently and ineffectively allocated if programmes were to be regarded as special, separate and in addition to normal public programmes.

This is an important point. The World Bank has stressed the importance of institutional development in relation to successful labour-intensive road construction (Cook et al., 1985).

Despite its title the SECP was not a programme but a number of uncoordinated projects. The lack of a properly conceived and executed programme was its major weakness. The overwhelming impression of the SECP is of its cursory, temporary, unplanned and haphazard nature. In part this stems from the political nature of the programme: to provide emergency employment to reduce the level of violence. In part the very nature of poorly planned emergency job creation focussing upon the provision of temporary job opportunities meant that very little of substance could result.

But other points need to be made. The promoters of the programme repeatedly stressed employment creation and the labour-intensive nature of the work. In fact temporary employment opportunities were provided but the work itself was not labour-intensive. As we will see below it could not possibly have been, given the lack of knowledge base, the lack of lead-in time, the lack of training in civil construction and the overall lack of

planning. Where civil work was attempted it would have been by essentially conventional methods or by labour-extensive methods i.e. extremely inefficient. However, the normal engineer and administrator has shown inadequate knowledge of this subject and such low expectations of manual work that the poor results did not surprise them and they had no idea how to improve the situation. Thus the unfortunate connotation between "labour-intensive" and "low productivity, low standards, difficult to manage" added to the lack of appreciation of the need to plan and engineer the work properly. Over the past four years the majority of the so-called labour-intensive work has been labour-extensive emergency job creation: very little of worth has been produced by highly inefficient means. Of equal concern is the fact that the disorganised nature of the projects, the low quality of the product and the expense have reinforced the prejudices of those who are against labour-intensive construction.

3. The Contractor

Some organisations have endeavoured to promote greater use of labour-intensive methods. The first attempts to increase the use of labour consisted of putting the onus upon the contractor to utilise more labour. The contract documentation contained exhortatory remarks to the effect that the contractor should make greater use of labour "wherever feasible". One project in Transkei was described as being built using labour-intensive methods. In the event, a mere R45 000 for a labour-only component was tacked onto a R7 000 000 project, the rest of which was carried out entirely by conventional means (although in the same town, the same contractor was using more local resource intensive methods on another project).

Some idea of the difficulties of introducing the greater use of labour at the design stage may be gained from a particular project (the following example is taken from Cohen, 1989). The construction of a sewer by labour-intensive methods was seen as a means of employment creation within a town and (even) of general upliftment within a region. (The fact that labour-intensive construction of a sewer was seen as leading to general upliftment of a region is an example of a common misconception among engineers as to the economic and social contribution which may reasonably be expected of construction as a whole and labour-intensive construction in particular). The consultant (the Engineer) made strenuous representations to the regional authority (the Employer) to the effect that labour-intensive construction was "a good thing" (it was argued that funds expended in the provision of infrastructure should remain within the populace through the use of labour intensive methods). Initially the Engineer categorically told the Employer and Project Manager that he could design for labour-

Only conventional contractors answered advertised invitations to tender. The tender results indicated that the contractors did not seriously investigate the extent to which the Engineer's exhortations could be realised in practice. For example, when asked to list all labour-intensive items allowed for in the tender, the following descriptions were received:

(i) "All pipe laying, manholes, fittings and certain sections of shallow excavation to locate existing services. All bedding to be handled manually."

(ii) "All items that a machine cannot do ±30 local labourers to be employed."

(iii) "Part of all excavation, backfill and compaction. Manhole building. Pipe laying."

(iv) "All excavation in easily pickable material and laying of all pipes and fittings."

(v) "Spreading bedding and blanket material. All labour on manholes, etc. Machines to lift pre-cast sections. All hand labour which will not be done by machines."

(vi) "'Company X' guarantee to employ on a full-time basis 20 local labourers at current rates." (Emphasis added by author.)

It may be seen that the Tenderers had little intention of seriously using labour-intensive methods. No blame can be attached to them, however, because the project had not been designed from the outset to be done labour-intensively and the contract documentation showed that the Engineer had only attempted to influence matters by exhortation.

In the evaluation of tenders the Engineer made passing reference to labour-intensive considerations but these had no bearing on their recommendations (in which they listed plant and plant hire rates). Phase 1 awarded to the abovementioned 'Company X' who, using plant, took a year to complete the contract works which had been scheduled as being of six months duration. Phase 3 was subsequently awarded to another contractor who intended to use equipment to construct the sewers.

From this sewer project it may be seen that, despite the good intentions of the Engineer and the Employer, it was not possible to achieve greater use of labour-intensive methods by tacking on a codicil, encouraging the use of labour, to a conventional contract document. Nor did token attempts to include labour-intensive methods "wherever feasible" or "wherever possible" have anything other than a token response from the contractors. Greater use of labour-intensive methods cannot be achieved on a project that has been designed to be carried out using equipment.

The construction process militates against incorporation of greater use of labour-intensive methods at the construction stage. Attempts to

achieve greater use of labour at the contractual stage overlook the nature of the construction process. The design, specifications, contract documentation and procedures were all oriented towards the use of conventional equipment based methods. Exhortation could not change matters one jot. The decision to use labour-intensive methods has to be taken prior to the construction stage and then fully integrated into the design and construction process.

4. Analysis and Design

The first response to the need to increase the productive use of labour had been to expect this to be achievable through the contractor. For those engineers who realise that the process has to start earlier other problems arise.

For long-term success in relation to proper employment creation, analysis and design are crucial elements that require detailed attention. There is an almost complete lack of appreciation of the need for such preparatory analytical work. Here there is a confusion between the civil and the building construction industries. It is not usually realised that building is already a labour-intensive activity; while additional work can be created simply by providing more funds, little more work will be created per unit of expenditure. In the construction of buildings the focus should be on maintaining the labour content: there is scope for increasing the labour content in the production of building materials. Furthermore, it is not necessary to initiate special training programmes requiring the development of new training material for building construction. In the building industry all the technical and training details have been worked out. The opposite is true for civil construction. In recent decades all operations have been equipment based. Transformation to the use of labour requires detailed analytical investigations followed by thorough training programmes to create the necessary supervisors who can set out, organise and monitor the work carried out by their labourers.

This state of affairs is exacerbated by the lack of appreciation of the magnitude of the employment creation potential in construction. Even professionals who are sympathetic to the idea are unaware that in relation to bulk earthworks labour-intensive construction means a 200-500% increase in the use of labour per unit of expenditure.

In conventional road construction the normal proportion of costs allocated to labour is about 10%. Experience elsewhere indicates that for rural road construction this proportion may be increased to 65%, i.e. if a rural road cost R100 000 per kilometre using conventional methods R10 000 would go to labour but through labour-intensive methods this could be increased (by 550%) to R65 000, for the same quality of product. For a

high standard road R1 000 000 per kilometre is a reasonable figure. Of this 10% (R100 000) would go to labour if built by conventional methods. Limited theoretical work indicates that this could be raised to 35% (R350 000), again for the same quality of product. While this has yet to be proven in practice for a major road, the estimates reveal a significant order of magnitude of increase in employment creation per unit of expenditure. However, it is only in rural road construction that the analytical work has been done in sufficient detail to enable the establishment of reasonable bench marks. In other sub-sectoral work (dams, streets, storm water, water supply, sewerage, irrigation) the analytical work has not been done which could indicate the upper limits of employment creation.

Even sympathetic engineers tend to think only of a marginal increase (10-20%). This low level of expectation hinders their recognition of the need for detailed investigatory work. It also hinders recognition of the magnitude of the task. The 10-20% view leads to an add-on approach which has little impact upon employment creation.

Another distortion which fits under this category is also a result of the lack of analytical work. Within a small circle mainly related to development work, there has recently been a sudden increase in interest in labour-intensive work, particularly as there is the realisation that donors are willing to provide funding. The author has seen proposals for supposedly labour-intensive work which on inspection reveal that the same proportion of expenditure has been allocated to labour as in a conventional design. Although labelled "labour-intensive" it is not so. A fashionable title has been appended to a conventional design. Yet it is difficult for an employer or donor organisation to detect this sleight of hand. The criteria do not exist whereby a knowledgeable person could decide whether the proposal has resulted in a significant increase in the proportion of expenditure devoted to labour. In the meantime the internal assessor is probably unable to detect that the proposal contains little other than pious words.

The time and effort required for the analysis and design of labour-intensive construction is significant. The following example (taken from Cohen, 1989) describes in some detail the verbiage used in relation to development work (the equivalent for the consultant of the exhortatory remarks for the contractor detailed above) and the consultant's dilemma in responding to the demands.

A major regional development project has the stated objective "to raise, with the full participation of the local communities, the standard of life of the people in the Durban/Pietermaritzburg area through the

promotion of Economic Development in its broadest sense ...". Development guidelines stated, inter alia,

> "There must be full involvement of the local community"
>
> "... local inhabitants must acquire their rightful share in the economy"
>
> "The locals must become employers, not only employees"
>
> "Money spent on projects must as far as possible be channelled into the pockets of the local communities"*

In order to encourage and draw local entrepreneurs into the economy it was postulated that labour-intensive methods of construction should be utilized to reduce the amount of capital required to undertake construction works. This thinking was reinforced by other statements in the consultants brief such as

> "... balanced approach with priority tending to small scale, informal, traditional and rural sectors" and
>
> "Although the importance of outside expertise is acknowledged, opportunities should be created for local participation and involvement (the creation of employment is not the main consideration, but rather that local people should have the opportunity to advance to managerial positions and participate as entrepreneurs.)"

In addition it was stated that in order to meet these objectives and guidelines, the individual projects would have to be broken into small sub-projects within the capabilities of local entrepreneurs and be designed in such a way that their lack of capital and experience would not be a barrier to participation in the development programme.

However, the consulting engineer faced a serious dilemma (Cohen, 1989). Most consultants think only in terms of conventional designs within the conventional construction process outlined above. Despite staff shortages, work overloads, severe time and internal budget constraints, they have developed systems for quickly producing designs, drawings and contract documentation. These systems have evolved over years of dealing with similar projects to the point that, within existing formalised fee structures, the consultant has developed office standards and can produce the requisite designs, make a profit and stay in business.

For example, by utilizing a standard method of measurement to prepare a schedule of quantities and by cannibalizing parts from different contract documents and using SABS 1200 as the specification, a tender document can be prepared within a few days of the preliminary drawings being produced. This whole system is geared towards conventional (capital-intensive) construction. And from past experience the consultant is able to estimate costs and construction times fairly easily. The design incorporates the method of construction.

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*Consultants Brief, 1989.

However, basic documentation does not yet exist for labour-intensive work; SABS 1200 (the standard specifications) only exist for capital-intensive methods. The dilemma was that the consultant interested in increasing the labour content did not have the experience, time or resources to re-think the entire design and construction process. Neither did the consultant have the resources to design a contract strategy to deal with the vagaries of the informal sector and small building contractors. If the design were based on the use of equipment, the consultant (the Engineer) would merely have to advertise the tender and would be sure to receive tenders from five to six contractors each willing to provide surety bonds, guarantees, insurance and capable of working to specification with minimal supervision. By contrast the development of labour-intensive construction using small contractors was seen as a continual battle: the design phase, the community participation struggle, contract documentation, attempting to find small local contractors and then training them to actually carry out the construction. The consultant would also find himself in the position of project manager (possibly without adequate remuneration) or even have to provide bridging finance to procure materials and pay small contractors every fortnight. All these problems were considered demotivators in the implementation of labour-intensive methods (Cohen, 1989). From this detailed description of a Consultant's views we see that the use of labour-intensive methods not only has to be integrated into the design stage and contract strategy but requires dedication on the part of the Consultant to overcome the demotivators presented by the method in these early stages of application.

Recently, led by one consultant, James Croswell, there has been some recognition of the need to incorporate the concepts of labour-intensive construction into the feasibility analysis (project report stage), the design and contract preparation stage and the construction process (Croswell, 1989(a), (b), (c)). The work was initiated for municipal infrastructure in Ilinge, Transkei and has been refined during the replacement of secondary water mains in Soweto. The progress has been achieved by the consultant engineer becoming the project manager and undertaking a host of tasks not normally carried out by the consultant. These tasks have included (i) the identification and training of potential contractors, (ii) development of appropriate designs, contract procedures and documentation, (iii) direct supervision of construction and (iv) direct control of materials. (DBSA, 1991)

This work has resulted in municipal infrastructure being produced in financially efficient terms. Technical, contractual and organisational lessons have been learned which would have to be integrated into a national employment creation programme (greater attention would have to be paid to

the bulk earthworks). But this particular group of consultants are in the distinct minority. Croswell in particular has had to absorb considerable criticism from both the consulting and contracting fraternities. Croswell has also felt the full brunt of the need to carry out preparatory analytical and design work.

Another important aspect of the requisite preliminary work for innovation is its cost. The consultant has been blamed for excessive charges. For the record, the overheads for the initial 3 years of the Kenyan RARP amounted to 84%, however, over the whole programme they were only 16% (Hagen, 1985).

5. Lead-in Time (Consensus/Start-up phase)

A significant lead-in time is required prior to wide-scale implementation of this type of work. The lead-in time results from the necessity for preparatory investigatory work, the need to train people to execute the work in different ways and the necessity for detailed planning. A significant lead-in time is also required in order to obtain the consensus of all the parties involved as to the concept and implications of the methods of construction. These parties include the government, the different ministries concerned (public works, labour, regional planning, legal), local authorities, local communities, trade unions, engineers. The World Bank has recommended that where no previous experience exists a start-up period of at least three years should be considered (World Bank, 1986). Please note that TURP (page 4) considered only six months to be sufficient.

Even policy makers who are sympathetic towards labour-intensive construction are reluctant to face the reality of the need for a lead-in period. Policy makers who are only concerned about employment creation and have little interest in the constructed product have even less appreciation of the need for a start-up period. Whilst the author is aware of his lack of competence in relation to psychological interpretation, frequent exposure to these attitudes has led him to consider that one of the major stumbling blocks is the perception that labour-intensive work is simple work by simple people using simple tools and, therefore, there is no need for sophisticated people to take the whole matter very seriously, i.e. no need to plan.

6. A long-term perspective

The lead-in time is only one aspect of the need for a long-term perspective in order to establish an employment creation programme. With the absence of an institution devoted to employment creation it takes time to establish one or adapt an existing institution. In relation to the

establishment of road maintenance systems (based mainly on equipment-intensive methods) the World Bank concluded that in no case had it taken less than ten years to establish a functioning system (World Bank, 1981). The Kenyan Rural Access Roads Programme was started in 1974, by 1977 it had only constructed 250 kilometres yet by 1986 it had constructed 8 000 kilometres of rural road. It was only gradually incorporated into the normal operations of the Ministry of Transport and Communications. In the case of Botswana, after the first attempt, in 1974, to establish labour-intensive road construction had gone sour, the Department of Roads (Ministry of Works and Communications) refused to have anything to do with these methods. Eventually the Ministry of Local Government and Lands initiated a pilot project in 1980. In that year only 3 kilometres of road were constructed and 20 people employed. It took until 1985 to establish a national programme and by 1990 nearly 2 000 kilometres had been constructed and over 3 000 people employed.

To date, in South Africa, only one programme has begun to develop a long term perspective: the Kwazulu Tribal Roads Maintenance Study. This perspective has failed to take root anywhere else.

7. A "programme" approach: institution building

In relation to low-volume rural road construction several organisations and administrations in South Africa have initiated pilot projects or studies aimed at creating both unemployment and infrastructure through the use of labour-intensive methods of construction and maintenance. Projects have been carried out in Transkei (T.A.T.U. 1984/5; 1987; Solinjani et al., 1989) and Kwazulu (Geddes, 1985; Little, 1987). In each case considerable efforts have been expended on the part of the engineers, officials and communities. However, these pilot projects have resulted in little more than the construction of short stretches of road. Because the projects have been implemented on an *ad hoc* basis as individual projects they have remained isolated projects. All the lessons learned by the officials, engineers and communities have remained with the individuals concerned, as has any training in road building. The fault lies in the fact that the projects were implemented in an institutional vacuum (McCutcheon and Veldman, 1990). The pilot projects must be implemented within an institutional framework that will ensure that the initial work is fostered. In order to achieve this it is necessary to create a specific institution or adapt an existing one. The World Bank recommends the latter (Cook et al., 1984). Either way it is certainly necessary to create the human resources to implement the projects. This is only possible through extensive training. This process can be used to build the institutional framework.

In the other African countries where national programmes now exist success has been achieved through what the author has termed a "programme" approach. This approach consists of four phases.

1. Preparatory (Consensus) phase
2. Analysis and Design phase
3. Pilot - initial training phase
4. Expanded training – national programme

The above approach has to be located within an institution, i.e. the programme is not solely dependent upon a particular set of enthusiasts.

This approach links to the earlier discussion about the need for a lead-in period. During the lead-in period phases 1 and 2 are carried out. For the purposes of this paper it is not considered necessary to describe in detail the components of the different phases, those interested are referred to another paper (McCutcheon and Little, 1991). However, the following list summarises the work required.

Phase One

Consensus on concept

Brief local and national authorities as to type, standard, funding and method of construction; and importance of training, institution (local and national), long-term political and financial commitment.

Draft long-term programme.

Phase Two

Analysis: institution (national and local); levels of funding; specific technical analyses; criteria for staffing; identification of first community and training site.

Preparatory Work: Administrative, Technical and Training Manuals, selection of staff, briefing of active community, revise forward plans.

Phase Three

Orientation and training of Trainers.

Start Training Programme.

Revise Training and National Programmes.

Revise Manuals and Reporting System.

Phase Four

Expand first training programme into a national programme. But expansion should only be allowed to proceed

(i) at the rate at which the training programme can produce skilled supervisors (the training programme must pay as much attention to character as to technical and organisational competence);

(ii) to the degree to which the national institution is able to absorb the trained personnel and function at the local level;

(iii) to the degree to which local communities are able to organise themselves.

Through the "programme" (as opposed to project) approach the institution is created together with the human resources required to implement the work from site level through to national coordination.

8. Community

The role of the community was mentioned several times in the previous section. This is a topic that deserves a paper on its own. A few comments about community will be made in this section. Civil engineers by definition are concerned with providing the physical infrastructure for civil society. Within the formal structures that exist there is seldom need to be directly involved with the community. In a sense the community's wishes should have been accommodated before the involvement of the engineer. The public sector Client should represent the formalised will of the people with respect to physical infrastructure. While there are innumerable instances of differences of opinion between the public sector and the public, the engineer has operated at at least one remove from the will of the public. Furthermore, within the formal construction process engineers have been vigorously encouraged to distance themselves from the political process in order to limit the possibilities of corruption.

From such a perspective it would be fair to say that conventional engineers have very little interaction with the community during their working lives. Consequently engineers are usually extremely naive in their understanding of communities. If they become involved in community development work without prior experience many difficulties ensue which quickly jeopardise the success of the work. What is the relevance of these remarks to labour-intensive construction? Simply that most labour-intensive construction requires good interaction with the community in order to succeed.

Conventional engineers have experienced difficulties relating to communities elsewhere in Africa. And these difficulties were experienced in places where local authority structures were legitimate and reasonably clearly defined. In South Africa the situation is compounded by the lack of legitimate local authorities. It becomes a major problem to define "the community" and identify its legitimate representatives. This problem cannot be overestimated.

As most conventional engineers are barely aware of the problem they tend to be easily misled by the first so-called representative community group with whom they came in contact. At this point I have watched several "Saul on the road to Damascus" conversions in which a previously socially ignorant engineer becomes obsessed by a simplistic belief in "the community". Some engineers become aware of the social complexities. An irony here is that sometimes these enlightened engineers become so involved in the local politics that they become unable to do any engineering.

In relation to rural road construction the author has proposed guidelines for local community participation (McCutcheon, June 1991). There is no doubt that additional guidelines should be prepared for the labour-intensive construction of municipal infrastructure. A major implication for employment creation programmes is that proper consideration of the community must take place during the lead-in time.

9. Small Contractors and the Public Sector

The creation of small contractors has a role to play in employment creation. In Kenya the workers, on both the construction and maintenance work, are employed on an individual contract basis. This process has been carried still further in Ghana. Yet in South Africa the emphasis by engineers and development institutions on the importance of the small contractor stems in part from "free marketeer" views of the benefit of the market and privatisation, and in part from a perspective that wants a middle class to develop rapidly.

These views have led to high expectations regarding small contractors whose work is based upon the use of labour-intensive methods. Several projects have fostered their development (Croswell, 1986; 1989, 1991). The author considers that these projects have attempted to achieve difficult objectives: not only the use of labour-intensive methods but also the abilities to run a company on a sound financial basis in an extremely competitive environment. According to the Wits Business School 75% of small businesses fail so it would be interesting to pursue the employment potential taking the failure rate of small businesses into account. Furthermore, the author considers that the requisite time and effort that has been expended on overall management of these projects and in the

training of small contractors could have been more effectively used in a programme rather than on individual projects. At the end of the project the training comes to an end and so does the contractor's work. If a long-term programme had been established and these costs allocated to a formal training programme far more would have been achieved per unit of managerial expenditure and the work would continue for much longer.

A corollary of the positive attitude towards small contractors and privatisation is a widespread scepticism within the professional engineering community regarding the efficiency of the public sector (plus a modicum of ignorance as to the source of funding for civil engineering). Many engineers find it difficult to consider seriously the employment of greater numbers of labourers within the public sector. Even if repeatedly told they do not appear to register that the public sector is the source of the funding and the institution responsible for the planning, control and overall evaluation of the programme but it is *not* necessarily responsible for the employment of the labour on a permanent and pensionable basis. The conditions of employment have to be structured to ensure that "a fair day's wage is paid for a fair day's work". The average engineer's contempt for the public sector thus overlooks the opportunity that the public sector could provide for large-scale action (the large scale replicability of small scale success).

10. Wages, Conditions of Service and the Trades Unions

In Kenya labourers are hired on monthly contracts, in Botswana they are paid monthly for 'casual' employment on a daily basis. For about 60% of the work it has been possible, through work studies, to determine the amount of productive work that can be carried out by an able-bodied person for the different activities, given variation in terrain, type of soil and climatic conditions. For any particular activity the supervisor is thus able to specify the amount of production (the "task") required in an eight hour working day. The labourers are also informed that when they have completed the task they may go home. It has been found that under these circumstances an eight hour task is usually completed in six hours.

The wage rate has caused much debate. Opinions vary from those who favour specifying the local agricultural rate to those who argue for the construction sector minimum (if there is one) or a living wage. In Botswana the government ruled that the wage had to be set lower than the construction sector; in Kenya the wage was above the national minimum. The wage that should be paid in South Africa would require serious consideration. On the one hand the current legislation specifies a minimum in the construction sector (over R30 per day in the Pretoria-Witwatersrand-Vereeniging area), on the other, the lower the wage the more people that

can be employed and the more likely that the poorer people will proffer themselves for employment (in 1985 the SECP wage was R5 per day, this has now risen to R7; Daveyton recently advertised temporary employment at R7,00 per day (Sowetan, November 18, 1991)). At the COSATU seminar mentioned earlier there were several opinions varying from the Unemployed Workers' Union which demanded R40 per day, to others who advocated consideration of lower wages because that meant the available funds could employ more people. The author would not pretend that this is not a difficult issue but he suspects that it is less divisive than might appear at first sight. However, it is a critical issue and one that would have to be studied at length *prior* to the initiation of a national employment creation programme: part of the necessity for a "lead-in" time-period.

Agreement as to conditions of service is equally important. Part of the success of these labour-intensive programmes was the consensus that has been achieved between different government ministries (especially the ministry responsible for the programme and that responsible for labour legislation), the trades unions, the local communities and the labourers, that wages were to be paid on a task basis and that the labourers were to be employed either on a monthly contract or a 'casual' daily basis even if paid monthly. It was not possible for labourers to become "permanent and pensionable" unless they underwent training and moved into supervisory or administrative roles.

Unless agreement can be reached prior to initiation of the programme on these key issues of wages and conditions of service it will not be possible to achieve reasonable productivities and a good quality product. Most of the members of the construction industry with whom the author has had contact have been uniformly pessimistic as to the possibility of the Trades Unions agreeing to the conditions of service outlined above. The inability to achieve good productivity through labour is one of the most frequently quoted reasons for the industry's scepticism regarding labour-intensive construction. The fact that labourers have been successfully employed on a task basis in Ilinge, Kwazulu and Soweto challenges such misconceptions particularly since the wages were significantly lower than the construction sector minimum.

DISCUSSION OF TWO MAJOR PROJECTS

In the light of the problems outlined above this section will discuss two major projects that have recently been initiated.

Recently, operating mainly through government departments, the State has released R1 billion from the strategic oil reserve. According to the instructions received by the various government departments the money has to be spent in such a way as to create employment. Concurrently the

Independent Development Trust (IDT) has allocated R750 million for projects to be undertaken by developers: the creation of employment was a stated objective of the funds being committed.

Before discussing the major limitations with respect to employment creation of this allocation of R1,75 billion it is worth putting this sum of money in perspective. If the whole amount were to be spent in a year it would represent roughly 0,7% of GDP; however, the strategic oil reserve money has to be spent within 15 months and the IDT within 16 months, which means the funds represent about 0,54% of GDP or about 1,7% of the budget. According to Abedian and Standish (1985) between 1920 and 1940 the proportion of government expenditure on unemployment relief measures varied from 0,6% in 1920 to 15,8% in 1935; in only two years, 1920 and 1921, was the proportion lower than 1,7%.

In the case of both the State and the IDT projects:

(i) there has been minimal forward planning (in the case of the R1 billion project, proposals had to be submitted within a few weeks of the announcement; the IDT only slightly longer);

(ii) there has been neither new investigatory work nor preparatory training;

(iii) the money has to be spent within 15 to 16 months.

Given these factors, in the light of the material presented earlier in the paper, it is extremely doubtful that, per unit of expenditure, any additional employment will be generated other than by the normal expenditure of such an amount of money. Given the lack of knowledge, lead-in time and training, essentially conventional construction methods will have to be used.

Unlike the SECP there should be some product worth having because the funding is being provided to government departments and private developers (the latter can only claim re-imbursement upon evidence of work produced). Nonetheless, on the basis of previous SECP experience together with the speed of expenditure there is reason to suspect that much of the money will not be used effectively.

It has been reported that the R1 billion will create 59 000 jobs for 15 months (or 47 200 per year). It remains to be seen whether these jobs are actually created. However, even if they are, what happens at the end of 15 months? The fact that this sort of funding has been made available shows that it exists in some form or other. Seeing that it exists the author would advocate that it be used in a different way to ensure more radical restructuring of construction works, longer term results and greater impact.

As seen above a major argument against labour-intensive methods has been that they are considered to be more expensive. This is not the case

for rural road construction nor municipal infrastructure. Any initial cost advantages to equipment decrease over time with the improvement in productivity resulting from training and increase in organisational capacity. There might be severe cost disadvantages to bulk earthworks but the experience in the construction and maintenance of rural roads and municipal construction suggests that the cost differential might not be as severe as it appears at first sight. Detailed research is required to explore this issue.

From an employment creation perspective, however, one should seriously consider earthworks. The civil engineering industry as a whole has a turnover of about R6 million; 50% of that would be earthworks: R3 billion. At the current rate of R30 per day wages would amount to R7 500 per year per person. If wages amounted to half the costs each job would cost R15 000 per year per person. R3 billion could result in 200 000 jobs per year. A fund of R1 billion in reserve would enable the financial cost to be a third higher for the creation of 200 000 jobs instead of the proposed 47 200. And systems would be set in place whereby this work could continue in a progressively competitive way.

The calculations in the previous paragraph are extremely cursory and speculative. Far more work would be required by competent economists to examine the extent to which the above guestimate is sensible or ridiculous. Regardless of the accuracy of the example, the currently proposed expenditure of State funding will not generate any more employment per unit of expenditure, neither will it result in any systematic way of increasing the employment created per unit of expenditure. Part of the accusation against labour-intensive work is that it is more expensive; yet the country has found R1,75 billion for work that is only ostensibly labour-intensive. The author suggests that the funds could have been used more imaginatively to create much more employment. At present the projects embody most of the criticisms of employment creation programmes that were listed earlier in the paper (page 4).

Despite reservations about the way in which the R1,75 billion will be used the present initiative will probably have much more impact than the SECP, (not just in relation to the quality of the product). It has definitely forced part of the consulting and contracting fraternity to *begin* to consider employment creation seriously. This new found enthusiasm has been encouraged by:

(i) the availability of some funding for work in the absence of other work (the civil engineering industry is operating at less than half its scale by comparison with 1980);

(ii) the rapidly escalating costs of equipment plus the change in the tax structure which is no longer quite as favourable for equipment

(recently regulations were changed so that instead of being able to write off 50% of the cost of equipment over the first year only 20% was allowed).

CONCLUSION

Future Programmes of Employment Creation in Construction

The tone of the paper should have shown that the author is convinced that it should be possible to alleviate (not solve) the unemployment problem through employment creation in construction.

The paper has provided ample evidence of the need for further research related to social, economic, political and technical aspects of employment creation in construction. It is all very well to have a theory and some evidence but in the South African context there are formidable problems in particular:

(a) an existing construction process that is based on fundamentally different methods of work: the changing of such a system requires detailed attention at the analytical and design stage;

(b) the sceptical attitudes of most of those involved in this process; even those who would be prepared to consider the methods can only think in terms of "emergency" employment creation with the consequence of poor quality, inefficient work;

(c) a fundamental lack of knowledge as to how to achieve results;

(d) a society that is riven with strife and there are no legitimate national or local authorities through whom to operate, i.e. the lack of an institutional framework.

(e) The oft reported rejection of this type of work by the Trades Unions despite other evidence to the contrary.

Despite all the problems outlined in the paper the author still hopes to see the establishment of a national programme of employment creation in the different sub-sections of construction. In their paper on the poor white problem Abedian and Standish concluded:

> While relieving unemployment, the State provided many positive externalities and many of the employment schemes contributed significantly to the infrastructure of the country e.g. forestry settlements, irrigation works, road construction and rail construction. Over a two decade period the state first alleviated and finally eradicated the poor white problem.

If an employment creation programme is to be championed by an organisation such as COSATU it would have to develop an overall strategy which would include the main points covered by the author earlier in the paper:

(1) Obtain consensus on the conceptual objectives.

(2) Long term (+ 10 years) national perspective.

(3) Detailed preparatory investigatory and analytical work, leading to

(4) Small scale pilot projects combined with embryonic training programmes.

(5) Expansion into national programmes at the rate to which

(i) trained people can be produced from the programme;

(ii) the local and national institutions can productively absorb the trained personnel.

The author suspects that this could only be achieved through the creation of a dedicated goverment department, possibly through the amalgamation of appropriate sections of existing departments of public works, transport, water affairs, manpower and education. In order to prepare the ground for a national employment creation programme considerable efforts will be needed by scholars from different disciplines to address the issues mentioned in this paper.

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