Mutual Aid 1: Africa to South Africa

"The Potential for Skills Development and Employment Creation during the Construction and Maintenance of High Quality Public Infrastructure and Building: the Case of Modern Labour-intensive Construction in Africa"

R.T. McCutcheon[1] April 2017

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Abstract

In South Africa there are insistent demands for public infrastructure and housing. These demands for public services lie at the core of current community discontent. Communities are also demanding 'jobs'. Employment creation is a national priority. Elsewhere in sub-Saharan Africa these different factors have been addressed through large-scale, long-term programmes using modern labour-intensive methods for the construction and maintenance of rural roads. The thorough training of skilled 'hands-on' site supervisors was a key component in the generation of a significant increase in employment per unit of expenditure. As importantly: linked programmes of training and construction were established. The requisite skills required at site- and multi-site level were generated within the programmes themselves. Consulting engineers played a major role in the formulation and implementation of these programmes: they re-engineered product and process in order to achieve specific socio-economic benefits: skills and employment.

The model derived from these programmes contributed to the formulation of South Africa's National (later Expanded-) Public Works Programmes. A related paper to this Conference argues that the latter have not been as effective with regard to skills development or employment creation. Given this situation and the fact that South Africa's National

[1] Division Head, Employment Creation and Construction, Malani Padayachee and Associates, Civil and Structural Engineering Consultants, South Africa; and, Professor Emeritus and Honorary Professor, School of Civil and Environmental Engineering, University of the Witwatersrand, Johannesburg, Wits 2050, South Africa

Development Plan envisages a role for future public works programmes, it is considered sensible to revisit the original models. Emphasis will clearly be upon the lessons that South Africa should learn from experience elsewhere in Africa. However, it is suspected that Africa can re-learn lessons from its own successes regarding principles and practice proven so effective from the mid-1970s through to the mid-1990s.

1. Introduction

The construction and maintenance of public infrastructure is a priority for many African countries. To state the obvious: engineering consultants play a central role in the process of construction and maintenance.

At the same time the generation of skills and employment are essential components of African policies to address development, economic growth and the alleviation of poverty. The provision of public building and infrastructure provides an opportunity for the generation of local skills and employment. Here, consultant engineers could play a greater role. But these 'secondary' benefits will not be achieved through the 'parachute' method.

Since the 1970s several countries in sub-Saharan Africa have used productive labour-intensive methods as a core component of public policy to achieve these multiple objectives. Labour-intensive construction[2] methods result in a significant increase in productive employment per unit of expenditure by comparison with conventional equipment-intensive methods. This is achieved without compromising time, cost and quality. However this cannot be achieved by superficial tinkering.

It will be seen that it is necessary to address many factors in order to establish an alternative socio-technical system even for single-site operations.

For success at individual site level, the generation of a significant increase in employment per unit of expenditure requires implementation of two very different components:

> Re-engineering of product and process to enable the use of efficient labour-intensive methods
>
> Prior training of 'hands-on' site supervisors who are capable of the technical and organizational skills required for the productive employment of teams of workers.

From the above descriptions it may be seen that two very different levels (and types) of training are essential: engineering and site.

Success at multi-site level on a large-scale requires the establishment of a formally linked programme of training and construction.[3]

It cannot be over-emphasised that attention to training is far more important than either the amount of construction or the amount of employment to be created. The physical construction

[2]Although this paper refers to "Construction", it must be emphasised at the outset that once the road has been constructed "labour-intensively", it may then be "Maintained" by even more highly labour-intensive methods. Furthermore, the term 'labour-intensive construction' implies that it is the use of the 'modern' labour-intensive methods developed through extensive research and development from the 1970s to date.

[3] Large-scale, multi-site operation - over the long-term - also required institutional capacity building at local, regional and national levels.

programme must only proceed at the rate to which competent engineers and supervisors have been produced.

However:

The modern-international construction industry is equipment-intensive.[4] The socio-technical system, which includes the 'mind-set' and understanding of all the participants –clients, consultants and contractors – is oriented towards the use of 'heavy', fuel-powered machinery

The outline above of several components of labour-intensive construction amounts to a very different socio-technical system to the conventional, capital-intensive construction industry.

In the face of the existing socio-technical system the implementation of effective labour-intensive methods has not been a straightforward or a simple process.

It has been easy to say, hard to do.

Despite constraints and difficulties, large-scale, long-term results have been achieved through the establishment of ***Programmes*** of construction, which have been integrally linked to formal training programmes. The human resources required to expand the programmes were produced within the programmes themselves.

Again, engineers played a crucial role, both in the engineering and in the organisational development.[5]

Based upon these principles there are successful examples, during the 1980s and 1990s, of long-term programmes in Africa, including Kenya, Botswana, Lesotho and Ghana.

While these programmes addressed relatively low-cost rural roads, the technical principles of labour-intensive construction are applicable to higher standards of infrastructure and building. This was proven in South Africa by research and experience in high-quality, high-standard infrastructure and building.[6]

In principle[7] South Africa adopted the approach for its National Public Works Programme (1994), which, in 2004, morphed into its Expanded Public Works Programme (EPWP). The use of labour-intensive methods was at the core of both the NPWP and the EPWP. In relation to infrastructure neither of these programmes achieved anywhere near the effectiveness of other sub-Saharan programmes. From 2004/05 to 2013/14 expenditure on the Infrastructure component of the EPWP amounted to R129 Billion ($10 Billion), which accounted for nearly

[4] Alternative words for 'equipment' would include: 'capital' and 'heavy machinery'; associated with the 'conventional-', 'modern-' and 'international-' construction industry.

[5] It must be emphasised that these in-depth and extensive studies were carried out by internationally respected civil engineering consultants, which included companies of the calibre of Scott Wilson Kirkpatrick. While economic factors were addressed by economists, the technical factors were addressed by hard-nosed reputable engineers. Together these collaborated to first establish the theoretical underpinnings of productive labour-intensive construction (the re-engineering of product and process) and later the establishment of linked training and construction programmes in Kenya, Lesotho and Botswana.. In SA re-engineering was carried out on much higher standards of infrastructure.

[6] Details and evidence may be found McCutcheon 2017b, the author's related Conference paper: "Mutual Aid: South Africa to Africa".

[7] The policy statements and supporting documents are replete with reference to 'labour-intensive'.

80% of total expenditure on the whole EPWP. While labour-intensity should have been at least 30%, it remains stubbornly less than 10%.[8]

While the EPWP has indeed failed to fulfil its mandate with respect to the anticipated amount of skills development and employment creation, there are other important reasons for considering that the development of proper linked training and construction could reveal the benefits in the future. Policy and legislation exist and there is a country-wide institutional network. What is missing is the full adoption of the lessons learnt from elsewhere in Africa.

This paper serves to draw the attention of Consulting Engineers to the principles and potential and the factors requiring attention for wide-spread, long-term implementation; in particular *'Re-engineering'*, which is the responsibility of engineers and senior management and *training* of the 'missing middle' required for site-implementation.

From a South African perspective, given the fact that the 2011 National Development Plan's recommended that public employment programmes would form a component of employment strategy until 2030,[9] it is considered essential to revisit the principles, theory, potential, practice and lessons learnt from other African experience. From this re-examination it will be possible to derive recommendations for future practice and the essential role of consulting engineers.

Elsewhere in Africa several of the programmes came to an end. This was not because of the ineffectiveness of the use of labour-intensive methods. During the 1990s, Botswana, for example, became too rich to qualify for aid funding. Since much of this work was carried out from the 1970s to the 1990s little institutional memory remains. Thus, from a broader African perspective, there are mutual benefits to be gained by countries in Africa from greater knowledge about the multi-faceted experience throughout the continent.

This paper will start with a definition of modern labour-intensive construction. It will then outline the intellectual basis of the concept and the principles derived from extensive research and experimentation. Large-scale, long-term programmes were implemented based upon these intellectual foundations and the principles. In turn these led to guidelines regarding the establishment of, and the guidelines for, large-scale, long-term effectiveness.

2. Definition

Modern Labour-intensive construction[10] (and maintenance) may be defined as the economically efficient employment of as great a proportion of labour as is technically

[8] McCutcheon 2017b op cit.

[9] NDP, 2011: in Economy and Employment (Chapter 3) the following is stated: *"Promoting employment in labour absorbing industries…Public employment programmes are an essential element of any employment strategy, taking on board lessons from successes and failures in our existing programmes. Up to 1 million opportunities will be created annually by 2015, mostly through community-based services. As market-based employment expands, so these opportunities can be reduced. However, they will be needed in large numbers over the entire period."(*2011: p 93

[10] During the 1970s and until quite recently, 'labour-intensive' was the term used in the literature. From a 'modern' policy perspective, a major problem with the use of this term is the very use of the word 'labour' which immediately leads to misconceptions: decision makers tend to focus upon 'labour' and its connotations of 'picks and shovels' (and 'slave-') and ignore the extent to which the success of this type of work depends upon appropriate policy, institution, suitability of project, quality and efficiency, organisation and training at site and managerial levels, including that required for proper contractor and sub-contractor development. The emphasis upon "labour" also ignores the findings of the South African National Productivity Institute, that management is responsible for 85 per cent of the improvement in labour productivity; labour for only 15 per cent. For these reasons the author prefers to use the term 'employment-intensive', which has broader implications. However, since 2002, in South Africa the term 'labour-intensive' is used in the legislation. Most of the 'labour-intensive' work in South Africa has been done through contracts and contractors. For this reason it is essential to use the term quoted in the legislation. Therefore, despite the author's preference, the phrase 'labour-intensive' has been used throughout.

feasible – ideally throughout the construction process, including the production of materials - to produce as high a standard of construction as demanded by the specification and allowed by the funding available; labour-intensive construction results in the generation of a significant increase in employment opportunities per unit of expenditure by comparison with conventional capital-intensive methods.

By *"significant"* is meant at least 300% to 600% increases in employment generated per unit of expenditure.[11] There are several further levels of labour-intensity, which may be obtained, depending upon the type of project and the parameters used to define economic efficiencies.

The first stage of labour-intensity is cost-competitive with conventional capital-intensive methods: i.e. a 300-600% increase in employment is obtained without compromising cost, time and quality.[12]

This definition is the result of extensive theoretical analysis, practical experimentation and large-scale implementation over a period of at least 40 years.[13]

An illustration is useful here: conventional rural road construction is highly equipment-intensive, less than 10 per cent of construction costs go to labour[14]; in labour-intensive, rural road construction, 65 per cent of construction costs go to labour: i.e. 6.5 times as much, an increase of 550%. Note here that these results are very different from a 10% - 50% increase in labour costs, which could only result in 11% - 15% of construction costs devoted to labour. Labour-intensive methods also substitute local for imported energy. This is achieved by following the principles provided below and implemented on a large scale through the development of programmes (for which a strategy and guidelines will also be provided).

A corollary, to this, is what it is ***not***: it is not the use of large numbers of people on relatively unplanned emergency or relief projects to construct something of ill-defined quality and value. That is 'labour-***Extensive***'**.** It is not possible to successfully combine the provision of good infrastructure constructed using employment intensive methods with emergency/relief/ "make-work" projects. The results have been a mess and have undermined the rationale and evidence of the beneficial results that have been obtained by proper labour-intensive methods. This is not to say that humanitarian endeavours are not required. Of course they are. But experience has shown that these cannot be combined with the labour-intensive construction of good quality infrastructure, particularly high standard infrastructure where the vast majority of public expenditure takes place.

Essentially modern labour-intensive construction has two main objectives:

- A technically sound (good quality), economically efficient product: equivalent to that achieved by conventional construction without jeopardising economic cost, time and quality;
- A significant increase in the use of labour per unit of expenditure.

[11] The range varies with different categories of construction. Greater detail may be found in the following: McCutcheon, *Chapter Two: Concepts, Potential, Principles, Issues/Lessons and Guidelines*, in McCutcheon and Taylor Parkins 2003.. Other summaries in McCutcheon 1995, 2001a & 2001b.
[12] Phillips (et al) 1995 and NEF 1995 Simplified
[13] World Bank, ILO, McCutcheon and Taylor Parkins (2003)
[14] A large proportion of this labour cost would be for operators and drivers, i.e. relatively well paid workers.

The principles, potential and practice have been given in detail many times.[15] These were published over fifteen years ago.[16] The principles still apply. Given the passage of time a full explication would be preferable. Unfortunately that would take up too much space. Below, a summary will be provided.

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3. Origin of the Concepts[17]

The intellectual basis for investigating the potential of labour-intensive construction is as follows:

> *Unemployment and underemployment are serious problems.*
>
> *Economic growth has not necessarily resulted in the benefits expected of it, especially for the poorest and least skilled.*
>
> *Employment needs to be generated within the existing economy.*
>
> *The reverse substitution of labour for equipment is worthy of consideration under certain circumstances related to the product and its process of construction.*

From the early 1970s to the mid-1990s the International Bank for Reconstruction and Development (World Bank) and the International Labour Organisation (ILO) carried out research into labour-intensive construction: desk-top studies, feasibility analyses, site experimentation and large-scale field implementation.

The initial research was performed in India,[18] Indonesia, Iran,[19] Nepal, Pakistan,[20] Philippines[21] and Thailand.[22]

It must be emphasised that these in-depth and extensive studies were carried out by internationally respected civil engineering consultants, which included companies of the calibre of Scott Wilson Kirkpatrick.

The IBRD study began in 1971 and was completed in 1986.[23] It was undertaken in three phases. The first phase consisted of a literature review and economic and technical feasibility studies (1971). A major conclusion from the first phase was that:

> *It is technically feasible to substitute labour for equipment for all but about 10 to 20 per cent of the total road construction cost for the higher quality construction standards considered.*

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[15] All the important refs and digital link.
[16] And 'pre-easy access digital'.

[17] See McCutcheon, op cit for a summary and discussion. The reader interested in greater detail is referred especially to the following references as a second point of departure:

[18] ILO ,1963.
[19] Irwin.,1975.

[20] ILO, 1977.

[21] Deepak Lal et al,1978.
[22] McCleary,1976.
[23] IBRD) (World Bank), 1971; World Bank/IBRD, 1974; World Bank/IBRD, 1986.

Further research revealed:

> Civil construction warrants attention as it embodies characteristics amenable to reverse substitution. In particular, all earthworks operations - excavation, Load, Haul, Unload and Spread (ELHUS) - warrant consideration.
>
> Earthworks comprise 50% of the cost of civil construction.
>
> Civil construction also warrants attention because of its role in the economy and the fact that its major source of funding (the public sector) should mean that it is possible to influence its behaviour in order to contribute to the achievement of the aims of government policy regarding employment generation.
>
> Other operations such as aggregate production also warrant consideration.

The aim of the third phase was to develop and demonstrate cost-effective, labour-intensive technologies in a number of different countries. Thorough field studies were carried out in India, Indonesia, Honduras and Kenya. Quite early in the Third Phase of the World Bank's research, the conclusion regarding technical feasibility was extended *beyond* roads:

> *Labour-intensive methods are technically feasible for a wide range of construction activities and can generally produce the same quality of product as equipment-intensive methods (1976).*

Extensive technical and economic analysis drew even more counter-intuitive results: *Under certain circumstances labour-intensive methods may be economically efficient by comparison with conventional methods.*

One of the major conclusions from Phase Three was that with superior tools, high incentives and good management, labour productivity could be improved to the point that labour-intensive methods could be fully cost-competitive with equipment-intensive methods at certain wages rates. Where the wage rates were less than US$2 per day, labour-intensive methods would be distinctly competitive. As importantly:

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

The average rate of inflation of the dollar has been about 5 per cent since 1982, so US$2 and US$4 in 1982 translate, respectively, to about US$5 and US$10 in 2003.[24]

In relation to the establishment of maintenance systems a conclusion from another World Bank study is also pertinent: *"No maintenance effort with which the Bank has been involved was foreseen and being of more than ten years duration. Yet none has taken less than ten years in practice."*[25]

[24] Substantiated by Majeres, 2003. However, the current amount would need to be re-examined taking into account all the factors covered in the 15-year World Bank study; especially the relative factor costs of equipment and labour. This would be a sizeable undertaking. In 2015 the author estimated that the amount in Rands would currently be at least R160 ($13).

[25] World Bank. 1981:p3

4. From Concepts to Principles for site implementation

Investigation of the World Bank and ILO research and later experience has revealed that, in relation to technical feasibility and economic efficiency, successful *single-site implementation* depended upon the following basic principles of labour-intensive construction:

The programme/project must be treated as proper engineering while giving serious consideration to carefully selected socio-economic objectives besides the product itself (i.e. a re-analysis of the product and the process whereby it is produced), with particular emphasis upon employment generation.

The product must be appropriate to labour-intensive methods.

Detailed technical analysis must be carried out.

From the start the project must be designed to be built by hand: in formal project management language this objective is the 'design driver'.

All specifications, contract documentation and tender procedures must follow suit. As far as possible the work must be based on individual or group tasks. In the case of individual tasks, it has been found that these can only be specified for about 60% of highly labour-intensive work.

During preparatory work (preparation period/pilot or demonstration projects) method and work studies should be carried out, iteratively, to reveal:

The various operations and optimal sequencing of such operations;

The various activities within each operation;

The individual and group tasks appropriate to the different activities and operations;[26]*;*

The balancing of activities within an operation;

The balancing of operations within a project.

Conditions of employment must be appropriate: the majority of the physical work will be carried out by daily or monthly employed labour - contractual arrangements require attention.

"A fair day's wage for a fair day's work"; and its corollary:

"A fair day's work for a fair day's wage." As far as possible where labour is concerned: no work, no pay.

[26] This type of analytical work is not peculiar to labour-intensive work. It forms part of the standard procedure with regard to the use of equipment; for example, balancing the numbers of mechanical excavators, loaders and trucks required for cut and fill. However, it is curious how often balancing is ignored in labour-intensive work. The labourers are then blamed for standing around doing nothing.

Health and safety issues must be observed. Workmen's Compensation must be in place.

The labourers make their own way to work: transport to site is their responsibility.

High quality appropriate tools and equipment must be specified, procured, and maintained.

Training must be extensive and good at what it sets out to do: particular attention must be paid to "hands-on" site supervisors (road builders) and multi-site supervisors (sites' supervisors or managers). The training process should pay as much attention to character as technical competence (those trained have to be self-motivated to work all day, every day, without direct supervision).

The labourers must accept instructions given by trained road builders.

There should be close liaison between site work and the local community: but liaison must not be the responsibility of the site supervisor who has to be on site all day every day.

Sites must be well organised.

Strong organisations are required with good management systems.

The last five do overlap with some of the factors influencing programme development. They are included here because of their importance for day-to-day site performance.[27]

And the corollary: the subject must not be treated as emergency relief.

Some of the above principles emerged first from the multi-site operations that were implemented on the basis of the work carried out during the desktop and single-site research; others became clearer during the large-scale work in Kenya and Botswana. We now turn to consideration of these multi-site operations from which further principles were derived regarding large-scale programme development.

5. From Principles for Single-site implementation to Large-scale, Long-term Programmes

Between 1971 and the mid-1990s the concept of modern labour-intensive construction progressed from being a hypothetical possibility to a practical reality. While we have seen above that the theory applied to much of civil construction, in Africa the concept has only been implemented on a large-scale in relation to the construction and maintenance of low-cost, low-volume rural roads.

National programmes[28] have been established in Kenya, Lesotho, Botswana, Ghana and Malawi. They have resulted in the generation of hundreds of thousands of person-years of

[27] McCutcheon and Marshall, 1996.

[28] These programmes have often been described as "force account". This stems from the days when a Department of Works was responsible for construction and maintenance and employed its "work force" on a "permanent and pensionable" basis. The continued use of this phrase is both inaccurate and unfortunate. It is inaccurate in that the majority of the workers in the labour-intensive programmes have been employed on a casual basis - paid on a daily rate. In fact, this was one of the reasons for advocating labour-intensive construction in the first place: to get away from a "permanent and pensionable" workforce (which

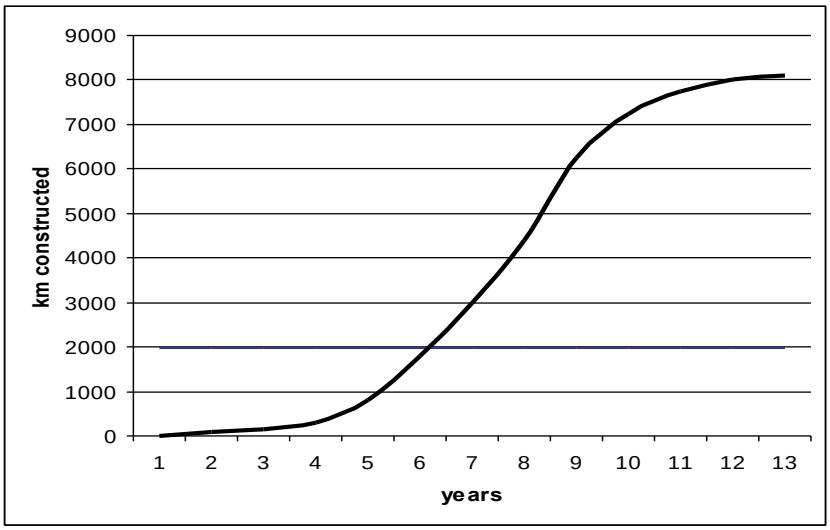
employment and the construction and maintenance of tens of thousands of kilometres of road. Although there are significant differences between these programmes (in particular those in Ghana and Lesotho where contracting companies are used for maintenance), the similarities are sufficient to conclude that within different institutional and organisational frameworks, a wide range of techniques of labour-intensive road construction and maintenance were extensively tried and tested. Local variations in product and process resulted from adjustment to different conditions: climate (arid to tropical); terrain (flat to mountainous); traffic (ten to several hundred vehicles a day); standards (spot-improvement to engineered gravel roads); and haulage (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. Workers have been employed on a casual or daily basis (but paid according to output i.e. task-based), on an 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, to motivate labour to construct a sound product, it is essential to train skilled "hands-on" site supervisors/road builders and multi-site supervisors who are technically and organisationally competent; and, that during training, as much attention should be paid to character as competence.

And, in all the large-scale programmes, the labour-intensive construction has been accompanied by even more highly labour-intensive maintenance.

The following Figure demonstrates the actual product achieved over thirteen years.[29] Please note the gradual start, during which training was taken place; followed by the increase in the rate of production resulting from the extensive basic training.

did very little work because the equipment was broken). The majority of the workers are certainly closer to self-employed construction workers than permanent employees (with associated substantial benefits) and, from that perspective, they are from the private sector albeit on an individual basis. The use of the phrase "force account" is unfortunate because it carries connotations of "forced" and "slave" labour. Neither of these implications is correct as the workers work voluntarily, can leave when they choose, are paid a competitive wage and are expected to perform reasonable amounts of work within an eight-hour working day. The programmes may more accurately be described as departmental. Certainly an "in-house" capacity is required to plan and implement the programmes; in particular extensive training is necessary to develop the capacity to organise and control the casually employed workers effectively. Some departmental capacity would be required whatever the mode of implementation adopted. It is considered that in these national a reasonable balance has been achieved between the public sector and private sector involvement.

[29] The Kenyan Rural Access Roads Programme



Actual Large-scale, Long-term Development Programme

The above thumbnail sketch indicates the order of magnitude of achievement and the sound basis from which principles may be derived. The scale and scope of achievement has been mentioned in order to indicate the order of magnitude of achievement. After all, large-scale implementation is a major objective - if implementation remains marginal, there will be no perceptible effect on employment generation.

The scale and scope of achievement also indicate the sound basis from which various conclusions have been drawn and inferences made. However, successful implementation depends upon several layers of understanding. Analysis of the research into the implementation of the fundamental concepts led to further research and implementation. Iteratively, this led to the delineation of various sets of principles and guidelines required to realise (even release) the potential within the concept. These sets are: first, principles governing successful implementation at site level; second, the reasons for success of large-scale programmes; and third, stemming from an understanding of the innovative nature of labour-intensive construction – particularly the extent to which it differs from the existing socio-technical nature of civil engineering – guidelines regarding a phased programme approach, which is required from the start in order to achieve the later successes of large-scale implementation.[30]

6. Reasons for the Success of Large-scale programmes

As long as the engineers are technically competent and reasonably aware of socio-economic realities, it is not difficult to establish a successful individual labour-intensive project.

[30]In the concluding Chapter of *Employment and High Standard Infrastructure*, the author has written "…now that the potential has been identified and many important issues addressed, there should be much to be gained by a closer co-operation with, and understanding of, developments in similar contracts in Asia"(McCutcheon and Taylor Parkins,2003: p432.

However, given the nature of remuneration for engineering and project management expertise, overheads will usually be extremely high on a "once-off" project: the ratio of expenditure on engineering and managerial expertise to that of employment on skilled, semi-skilled and unskilled labour will be inordinately distorted. This can only be addressed if a number of projects can be designed and supervised by the same engineering/managerial component. It takes as much high-level technical expertise for one project as it does for many more. *In Kenya, for example, the ratio of overheads to direct construction was 84:16 during the first three years (1974-76) but 16:84 over the whole period 1974-1986. Expenditure on training amounted to only 1.5-2 per cent of programme costs.*

In order for labour-intensive methods to be effectively used on a large-scale, they have to take this into account, which leads to the need for programmes of work. Experience with the setting-up and running of large-scale programmes revealed that a range of issues required attention for large-scale, long-term success. In 1990 - drawing in particular on the experience and analysis of the programmes in Kenya and Botswana - it was considered that the following factors were the main reasons for their success:

Major policy and decision makers understood the concepts and principles of labour-intensive work and the principles of long-term programmes.

Programmes were long-term and national. Programmes were not ad hoc projects.

There was a sound intellectual assessment of the technical feasibility and economic efficiency of labour-intensive methods: cognisance was taken of technological and institutional capacities. The principles of labour-intensive work were incorporated into the daily work.

Re-engineering: Technical, institutional, organisational, managerial and socio-economic aspects received concentrated attention during preliminary work, continued through pilot projects, embryonic training programmes and subsequent large-scale, national programmes. Technical matters included design, standards of construction and maintenance, specifications, tools and equipment, and methods of construction. Institutional matters included the decentralisation necessary for grass roots success and the centralisation necessary to plan and co-ordinate a large programme. Organisational and managerial aspects included the type of organisation required, the management structures and systems (recording, reporting, monitoring, controlling and evaluation) and training. Socio-economic aspects included wage rates, conditions of employment, labour legislation, labour supply, role of women and evaluation. Prior agreement was reached between the different parties with regard to wage rates, conditions of employment and the role and responsibilities of the community.

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

Training was extensive and good at what it set out to do, viz. the training of "hands-on" site supervisors/road builders, multi-site supervisors, clerks, vehicle/tractor drivers and artisans.

There was long-term political support. In Kenya this was true throughout the programme, whereas in Botswana, during the early years, it was touch and go whether

the highest levels (President and Vice-President) and some senior officials would outweigh the negative views of senior members of Parliament and many district officials.

Long term financial commitment was provided by Government and donors.

On balance there was good co-ordination between Government, government departments, those administering the programme, local authorities, those providing technical assistance and donors. Independent evaluation assisted as did the continuity and commitment provided by particular individuals.

And again the corollary: they are ***not short-term relief projects***.

7. The Need for Programmes for success in Projects

Reflection upon the reasons for success and the difficulties experienced indicated the importance of the process by which programmes are established; in particular: their initiation, early stages of expansion, training and institutional framework. While the lists of reasons for success and failure are useful as a checklist of issues which require attention, they do not provide any guidance as to how to go about the establishment of a programme. A strategy is required to establish large-scale employment-generation programmes for the construction and maintenance of public works. The strategy includes the following:

Major policy- and decision-makers must understand the concepts and principles of labour-intensive construction and the guidelines regarding a programme approach to long-term development programmes.

A long-term perspective must be adopted in which a *Programme* is developed (not *ad hoc* projects).

Identification and delineation must be carried out of the type of work and project which could incorporate greater use of local resources, in particular unskilled and semi-skilled labour and clerks, supervisors, technicians and administrators. These would include detailed analysis of the extent to which local resources could be used (technical assessment).

Attention must be paid to the other factors listed in the "Reasons for Success": including institutional, organisational and socio-economic factors.

Linked programmes of training and construction.

It is necessary to stress that all successful large-scale employment creation programmes have been integrally linked to formal, long-term, "in- house" (departmental) training programmes. All levels of participants require training:

Policy/decision-makers require proper (not cursory) orientation.

Engineers and senior managers require education and training.

"Hands-on" site supervisors (for example, road builders) and multi – site managers / supervisors require extensive training. This training includes both "classroom" (formal

building or a test on site) training as well as mentored, on-site, experiential training. Training at this level must pay as much attention to character as technical competence. The minimum education requirement for a road builder would be Grade 12. Thereafter, nine months of alternating site and class training would be followed by nine months of mentored site work.

Small contractors require appropriately structured training similar to that for "hands-on" site supervisors.

Community capacity building is required: community development committees and local authorities need orientation and training.

Specialist activities require specialised training: clerks, storekeepers, artisans, and drivers.

Workers require training in the use of tools and they often need nutritional support at the beginning of the project/programme.

Three aspects of training must be appreciated: In the first place it is important for all levels. At the higher levels orientation, education and training is required in order to ensure that the approach is correct and that this is accompanied by competence in relation to various issues discussed (including, inter alia, planning, design, documentation tendering and senior supervision).But training is absolutely essential in content, thoroughness and extent at the level of the "hands-on" site supervisor and multi- site supervisor/contractor

Secondly, if the trainees are recruited from poor households there will be a long term contribution to poverty alleviation if infrastructure is constructed by employment intensive methods

Thirdly, if the training has formal recognition and is structured in such a way that it can be useful to industry at large, provided some additional training is carried out. Thorough basic training means that the trained person is even more likely to obtain continuity of work; or be eligible to look for work elsewhere.

The establishment of a "Programme" (not "project") for large-scale replication of innovatory work would be possible through the following phases:

Phase One: Orientation

Consensus of all parties concerning policy objectives, types of different projects in one programme, method of construction, conditions of employment and many other factors. Orientation and education is critical: policy makers, clients, communities, consultants, contractors, unions and managers must have an understanding of the concepts and principles of labour-intensive work (policy objectives, the macro-economic context and the need for technical feasibility and economic efficiency). And an appreciation of the programme approach to development: "grow your own".

Phase Two: Preparatory Work

Analysis and planning.

Phase Three: Pilot/Initial Training

Pilot and/or demonstration projects incorporating an embryonic training programme. Review of progress to date.

Phase Four: Expanded Training leading to Large-scale Programmes

Expand the pilot and demonstration projects and training programme into a large-scale local, provincial and/or national programme.

But expansion should only be allowed to proceed at the rate or degree to which:

> The training programme can produce skilled "hands-on" site-supervisors ("road builders"), multi-site-supervisors, clerks, artisans and engineers. Training must pay as much attention to character as technical competence.
>
> Local communities and institutions have the capacity to absorb the trained personnel.
>
> The national/provincial institution is able to absorb the trained management personnel and maintain its overall role in relation to budget, planning, co-ordination, monitoring and control.

This approach has to be located within an appropriate institutional framework: national, provincial, and local. The institutional framework must be identified and suitably adapted early in the process. The above strategy ensures the requisite individual development and institution building at community, local, provincial and national levels. During the "lead-in" period (for countries without prior experience, the World Bank (1983) recommended at least three years) Phases One, Two and Three are carried out (there will be a measure of overlap). During these phases overheads are high. However, once the preparatory work has been done, training initiated and the institution established (or suitably modified), overheads revert to more normal ratios. To re-iterate: in Kenya the rates of overheads to direct construction costs was 84:16 during the first three years (1974-76), but 16:84 over the longer period from 1974 to 1985. And expenditure on training amounted to only 1.5 to 2 per cent of programme costs. Through this "***Programme***" (as opposed to "project") approach, the institution is established together with the human resources required to implement the work from site-level through to large-scale planning and co-ordination.[31]

8. In Closing

Modern labour-intensive construction has a sound intellectual basis. Principles for single-site construction were derived from extensive research and experimentation. Large-scale, long-term programmes were implemented based upon these intellectual foundations and the principles. In turn these led to guidelines regarding the establishment of and the guidelines for large-scale, long-term effectiveness.

To reveal the potential contained in its definition, modern labour-intensive construction requires attention to the following: appropriate policy and legislation regarding conditions of

[31]McCutcheon and Marshall, 1998.

employment, methods of work and remuneration; re-engineering of the project and process; and thorough training, particularly at the level of the 'hands-on' site supervisor.[32]

Skills development is an absolutely essential component. There is thus a direct link between productive employment creation and skills development.

Speaking generally, any skilled artisan generates work opportunities around him/her for unskilled people, who, besides gaining an income will also be closer to opportunities to improve their skills. Artisanal development must therefore be at the core of national policy. The use of labour-intensive methods provides even greater opportunities for skills development and employment creation. Focusing upon the potential within the construction industry for a 'significant increase in employment per unit of expenditure': this significant increase will only take place once the 'hands-on site supervisors' have been thoroughly trained. In relation to modern labour-intensive construction the 'hands-on site supervisor' is the equivalent of the artisan.

From the above it may be seen that expenditure of public funds on high standard public infrastructure may be done in such a way as to also develop skills and create employment. But these secondary benefits at the local level will not be achieved through the 'parachute' method. They can only be achieved through a long-term programme approach that links the whole process, including the following: conception, design, contractual documentation, training at all levels, and site organisation and management. Consulting engineers should play a greater role in re-engineering the provision of high-standard public infrastructure so as to also generate skills and employment. It is also suspected that Africa can re-learn lessons from its own successes.

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[32] In South Africa the 'hands-on' site supervisor has an accredited qualification: NQF4 Construction Processes Site Supervisor

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