African Partnerships for Sustainable Growth

ROBERT MCCUTCHEON
Mutual Aid 1: Africa to South Africa
Modern Labour-intensive Construction in Africa
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Skills Development and Employment Creation during the Construction and Maintenance of High Quality Public Infrastructure and Building:

Modern Labour-intensive Construction in Africa

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Structure of Presentation

Introduction

Definition

Concepts:
  Technical Feasibility
  Economic Efficiency

Principles

Programme
Introduction

• Need for Infrastructure
• Need for Skills and Employment
• Need to generate both skills and employment *within* the existing economy
• The use of labour-intensive methods provides an opportunity to meet both physical and socio-economic objectives
Importance of Work
People create their world and themselves through their work

- Subsistence ...Food...Staying Alive
- Self respect...recognition
- Social progress
- Quality of life
- Satisfaction
- Co-operation
Modern Labour-intensive Construction
Definition et Principles
Modern labour-intensive construction is the *economically efficient* employment of as great a proportion of labour as is *technically feasible* (throughout the construction process including the production of materials), in order to achieve as high a *standard* as demanded by the *specification*...
...the result:

a *significant* increase in productive employment generated per unit of expenditure

by comparison with capital-intensive methods *without compromising time, cost and quality*
Result **must** be:

...a **significant** increase in employment per unit of expenditure...

At least a 300% increase
Justification for the use of Labour-intensive Construction: Extensive Analysis, Research, Field Experimentation and Large-scale Implementation carried out by high-calibre engineers and economists

World Bank:

“The study of the substitution of labor and equipment in civil construction” (1971-1986)

Emphasis on:

• Technical feasibility
• Economic efficiency
World Bank: Crucial Study 1971 to 1986


International Labour Organization: linked to Bank Study

TECHNICAL FEASIBILITY

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 (conventional) methods. (World Bank, 1976)
Whenever the basic wage actually paid...is less than...about USD $4 per day (1982 prices), and labour is available in adequate quantities, the alternative of using labour-intensive techniques should be seriously considered.

(World Bank, 1983)
ECONOMIC EFFICIENCY (2)

Whenever the basic wage actually paid...is less than...about USD $10 per day (2002 prices), and labour is available in adequate quantities, the alternative of using labour-intensive techniques should be seriously considered. (World Bank, 1983 updated ILO, 2003)

2015: South Africa about R160 ($13.3)
### THE CHALLENGE TO ENGINEERS

**PERCENTAGE of DIRECT CONSTRUCTION COSTS to LABOUR**

<table>
<thead>
<tr>
<th>SECTOR</th>
<th>CONVENTIONAL % SPENDING (MAX)</th>
<th>LABOUR-INTENSIVE % POTENTIAL (MIN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROADS</td>
<td>10</td>
<td>30 to 65</td>
</tr>
<tr>
<td>STORMWATER</td>
<td>10</td>
<td>45</td>
</tr>
<tr>
<td>WATER SUPPLY</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>DAMS</td>
<td>15</td>
<td>50 to 80</td>
</tr>
<tr>
<td>LOW-COST HOUSING</td>
<td>30</td>
<td>35</td>
</tr>
<tr>
<td>RAILWAYS</td>
<td>10</td>
<td>25</td>
</tr>
</tbody>
</table>

Source: NEF 1994
Summary: On Average

- Conventional capital-intensive: 1 job
- Labour-intensive would create 3 to 60 jobs
- The considerable variation dependent upon type of project and operation within a project
- And location of project
- 3 to 5 for high standard infrastructure
- 60 for simple infrastructure in a remote area
Re-engineering: *Approach, Product and Process*

- Use capital expenditure opportunity in the major economy to generate skills and employment.
- Re-engineer industry so that all projects can become as labour-intensive as possible *without compromising time, cost and quality* (once systems have been established).
- Re-design projects: “As far as possible all work must be done by hand.”
- Greater use of labour and other local resources becomes the “Design Driver.”
- Policy, legislation and regulation must be in place.
- Application and enforcement required.
Re-engineering: *Approach* to Product and Process

Use capital expenditure opportunity in the major economy to generate skills and employment

Re-engineer construction product and process so that all projects can become as labour-intensive as possible without compromising time, cost and quality (when systems have been established)
Re-engineering: ‘Product’

Re-design projects: “As far as possible all work must be done by hand”

Greater use of labour and other local resources becomes the “Design Driver”:

– Re-design

– Appropriate Specifications

– Organisation: (Task based Individual and Group)

– Output-based remuneration
Re-engineering: Labour-intensive Construction: *Principles 1*

Core Principles for *Single-Site* Success

- Project treated as *proper* engineering
- *Re-engineer* Product and Process
- ‘Design driver’: labour-intensive
- Re-Design, Specifications, Contract Clauses, BoQs
- Economic Efficiency: Conditions of Employment: Output based remuneration: ‘*Task based*’ (Individual and Group Tasks)
- Tasks and Teams Balanced
- Corollary: *not* treated as *Emergency Relief*
Increase Labour Intensity
Four Methods

1. *Substitution*
2. Revival
3. Modification
4. New
Substitution of labour for non-essential equipment
Examples of *Substitution*:
Large-scale and over the Long-term
Kenya, Botswana, Lesotho
KENYAN RURAL ACCESS ROADS PROGRAMME
Before
During
Substitution of labour for non-essential equipment
After
Maintenance
Kenyan Rural Access Roads Programme
1974 to 1986
Botswana

Standard of construction higher than Kenya
Lesotho
Labour-intensive placement and construction (Lesotho, 2001)
Access road excavations in rock
(Lesotho, 2001)
Completed road on rock bed (Lesotho, 2001)
Re-engineering: Labour-intensive Construction: Principles 2
Core Principles for Multi-Site Success

• Proper engineering: Re-engineer Product and Process

• Plan a long-term Programme of construction projects

• Training good and extensive, particularly: ‘Hands-on’ Site Supervisors and Multi-site Supervisors

• Formal linkages between Training and Construction Programmes

• Start small expand gradually

• Corollary: not treated as Emergency Relief
The Need for *Programmes*
for
Success in Projects
Long-term, Large-scale *Programmes* of Skills Development

What is a *Programme*?

- A Series of similar / related projects are planned
- Projects are formally linked to a specific training programme
- Start small expand gradually
- Expand at rate to which:
  - Training programme produces skilled personnel
  - Local authority / community can absorb trained personnel
  - Responsible authority can plan, budget, fund, co-ordinate, monitor, evaluate
Orientation/Education/Training

All levels of decision-making and management require orientation/education, or training

Policy Makers
Local Politicians/Administrators
Programme Managers
Engineers
Multi-site Supervisors
Community Liaison
“Hands-on” Site Supervisors
Support Staff
Training

Particular attention required for the training of the ‘Hands-on’ Site Supervisor the ‘Missing Middle’
Successful Large Scale Programmes of Labour Intensive Construction and Maintenance Have always been linked to Specific Training programmes
Site Supervisors: Serious training required
Quality and Extent must not be underestimated

• Technical: Set out the work taking into account: horizontal and vertical alignment, layer works, side and cross road drainage
• Organise (1): Set the individual or group tasks for different activities under different soil conditions
• Organise (2): Balance activities within specific operations and between the different operations that comprise the construction of a road
• Administration and Control (1): Attendance, tools, equipment, discipline, health and safety, disputes
• Administration and Control (2): Reporting: muster rolls, daily and weekly, planned and actual
Artisans

- Depending upon the type of building and infrastructure, various different types of artisan are required: carpenters, masons, brick layers, steel fixers, plumbers, roofers, plasterers, painters, mechanics.
- Much of the work takes place in isolated places.
- One needs to be confident that the various types of artisan can work independently with minimal supervision.
- This means that they need to have a thorough technical training plus an experiential base.
- The experiential component can be developed during a proper programme but to start must be off the critical path.
- The ‘hands-on’ site supervisor is the equivalent of an ‘artisan’.

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For every trained ‘hands-on’ site supervisor, work can be created for
5 to 60 unskilled workers

Ratio of ‘Hands-on’ Supervisor to Workers varies from 1 to 5 to 1 to 60

Plan on Average of 1 to 10 (Roman)
Kenyan Rural Access Roads Programme
1974 to 1986
Kenya: Rural Access Roads Programme

Overheads: 16%

Production: 84%

10 to 12 years
Long-term Development is *NOT* Short-term Relief
Four Phased Programme Approach

• Orientation/Education Policy-makers, Officials, Engineers regarding Concepts and Principles

• Analysis and Preparatory Work:
  – Re-engineering
  – Construction Programme Planning

• Start Thorough Training and Demonstration Projects: Link Training to Construction Programme

• Expand Programme gradually: at the rate to which you have
  – Trained Personnel and
  – Institutional Capacity
Re-engineering (3)
Programme: S - Curve for Development

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Thank you for attending.