

FIDIC-GAMA 2017



Conference on Infrastructure

7 - 10 May | Cape Town | South Africa

African Partnerships for Sustainable Growth

ROBERT MCCUTCHEON

**Mutual Aid 2: South Africa to Africa
South African Public Works Programmes and
Modern Labour-intensive Construction**



#FIDIC_GAMA2017

Mutual Aid 2: South Africa to Africa

*Consulting Engineers and Socio-economic Development:
Potential Contribution to Sustainable Development in
Africa:*

*South African Public Works Programmes and Modern
Labour-intensive Construction*

R McCutcheon

Division Head, Employment Creation and Development, MPA

Professor Emeritus and Honorary Professor, WITS

FIDIC GAMA May 2017



Order of Presentation

Introduction

Developments in South Africa before the EPWP

Re-engineering

High-standard Infrastructure: Research and Field

Demonstration by, or in association with, the University of the Witwatersrand (Wits)

Expanded Public Works Programme (EPWP)

- Major Positive Conclusions

- Critique of Programme

- Critique of Infrastructure Component

Recommendations

Introduction (One)

- Demands for Services including Public Infrastructure and Housing
- Unemployment SA Statistics
 - Narrow Definition: 27%
 - Broad Definition: 37%
 - Disaggregated:
 - ‘Black’:
 - » All: 46%
 - » 15 to 35: 68%
- 50% of “black” males under 30 are unemployed
- Low levels of Education and Skills

Sunday Times 9th July 2006



Sunday Times

JULY 9 2006 / R9.50 INC. VAT



Botswana P11.40, Namibia N\$14.20, Swaziland R9.50, Zimbabwe Z\$300 000



SA's millionaire boom

In just one year, BEE deals help propel a 'phenomenal' 5 880 people into the 43 000-strong ranks of the seriously rich

Sunday Times 16th July 2006

July 16 2006

NEWS

LUNCH

Sunday Times 5

Dollar millionaires? Try R5 a day

Last week we reported on the growing numbers of super-wealthy South Africans. This week we look at research showing that 15% of us live far below the poverty line

The Star

13th July 2006

BUSINESSREPORT

www.businessreport.co.za

SOUTH AFRICA'S NATIONAL FINANCIAL DAILY

THURSDAY, JULY 13 2006

Half of SA survives on R20 a day

Job Creation is a strategic priority of Gauteng's Budget Statement 2003/04

“...Recent survey results have shown that *the one burning plea from ordinary South Africans is the desire to be employed*”

Hon J Moleketi Budget Speech, 4th March 2003

Introduction (Two)

Need to generate employment and skills in the *major* economy

Use opportunity provided by *normal capital expenditure*

Potential to construct *high-standard infrastructure* and generate employment and skills through *labour-intensive* construction

Use Provincial Infrastructure Grant and *Municipal Infrastructure Grant*

WORK NEEDS SKILLS

Legacy of Apartheid Legislation:

Bantu Education Act

Job Reservation....

There is a LACK OF SKILLS

Chief Luthuli's Response (1)

Letter to Prime Minister 28 May 1957

- The Master and Servant's Acts, which are designed effectively to *limit to unskilled categories* the participation of the African people in industry and commerce. This relegates the bulk of African workers to low uneconomic wages. My people note with grave concern the efforts of your government to *destroy* the African trade union movement
- The African people are similarly disturbed by other measures...such as the bill of Apartheid in University Education

Chief Luthuli's Response (2)

A Message to Every Voter from the African National Congress, April 1958

- **Every door** through which we might have sought advancement, culture and a higher civilization has been **slammed in our faces**. Our schools are being turned into schools of ignorance and servitude. The universities are being closed to us.
- **Any sphere of employment other than ill-paid unskilled labour is being closed to us.**

Effects of Apartheid Legislation

“EDUCOCIDE”

Work needs Skills
Skills need to be generated

Modern Labour-intensive Construction and Maintenance offers the opportunity to provide public infrastructure; accompanied by:

- Skills Development
- Productive Employment Creation

Developments in Modern Labour-intensive Construction in SA before the EPWP

- Innovatory Engineering by James Crosswell in Eastern Cape
- Extensive Research and Field Demonstration by, or in association with, the Department of Civil Engineering, University of the Witwatersrand
- Framework Agreement 1993 / 94
- National Employment Creation Programme Using Labour-intensive Methods for the Construction and Maintenance of Public Infrastructure 1994
- National Public Works Programme (NPWP) 1994
- Legislation
 - Special Public Works Ministerial Determination 2002
 - Division of Revenue Act 2004

Re-engineering (1) **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 (2) ‘*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
- Contract clauses added / amended
- Link to BoQ: Items labelled “L-i”
- If item not done labour-intensively: *not paid*
- Organisation: (Task based Individual and Group)

Re-engineering(3): ‘*Process*’

Plan a long-term *Programme*

Re-design for Labour-intensive

Revise Contract and Documentation

Thorough and Extensive Training

Start small expand gradually

Training, Training, Training

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

Re-engineering
for
Skills Development and Employment

Before the EPWP: Some Excellent Examples

- o Valley Trust (Mann & Little)
- o Eastern Cape (Croswell)
- o University of the Witwatersrand (Phillips, van Steenderen, Quainoo)
- o Durban (Waterbound Macadam)
- o Johannesburg (Horak),
- o Soweto (Gertzen)
- o Mamelodi (van Steenderen)
- o Great North Road N1 (van Steenderen),
- o Mofololetse, Greater Sekhukhune
- o (Taylor Parkins & van Steenderen)
- o Slurry bound Macadams, Macadam Franchise and Spinning Beam (Hattingh)

Evidence from South Africa

In South Africa labour-intensities of 40% have been achieved for high standard urban bus routes and for elements of provincial roads

THE CHALLENGE TO ENGINEERS
PERCENTAGE of DIRECT CONSTRUCTION COSTS to LABOUR

SECTOR	CONVENTIONAL % SPENDING (MAX)	LABOUR-INTENSIVE % POTENTIAL (MIN)
ROADS	10	30 to 65
STORMWATER	10	45
WATER SUPPLY	10	30
DAMS	15	50 to 80
LOW-COST HOUSING	30	35
RAILWAYS	10	25

Source: NEF 1994

Re-engineering:
Re-design (1): Roads and Stormwater

Major and minor roads

Stormwater drainage – stone pitching

Rubble masonry culverts and bridges

Drifts

Retaining walls

Gabions

Landscaping along the route

Increase Labour Intensity

Four Methods

1. Substitution
2. Revival
3. Modification
4. New

Increase Labour Intensity

Four Methods

1. Substitution

In relation to roads this was described and discussed in ‘Mutual Aid 1: Africa to South Africa’



**Zimbabwe: Based on techniques developed in Botswana
this road is built to higher standards than those specified in Kenya**

Stormwater Drainage and Culverts

Before



Mohlaletse, Greater Sekhukhune: Donga before...

After



Mohlaletse, Greater Sekhukhune Stormwater Drainage (2)



Mohlaletse, Greater Sekhukhune Hand operated Concrete Mixer





Mohlaletsi in Greater Sekhukhune

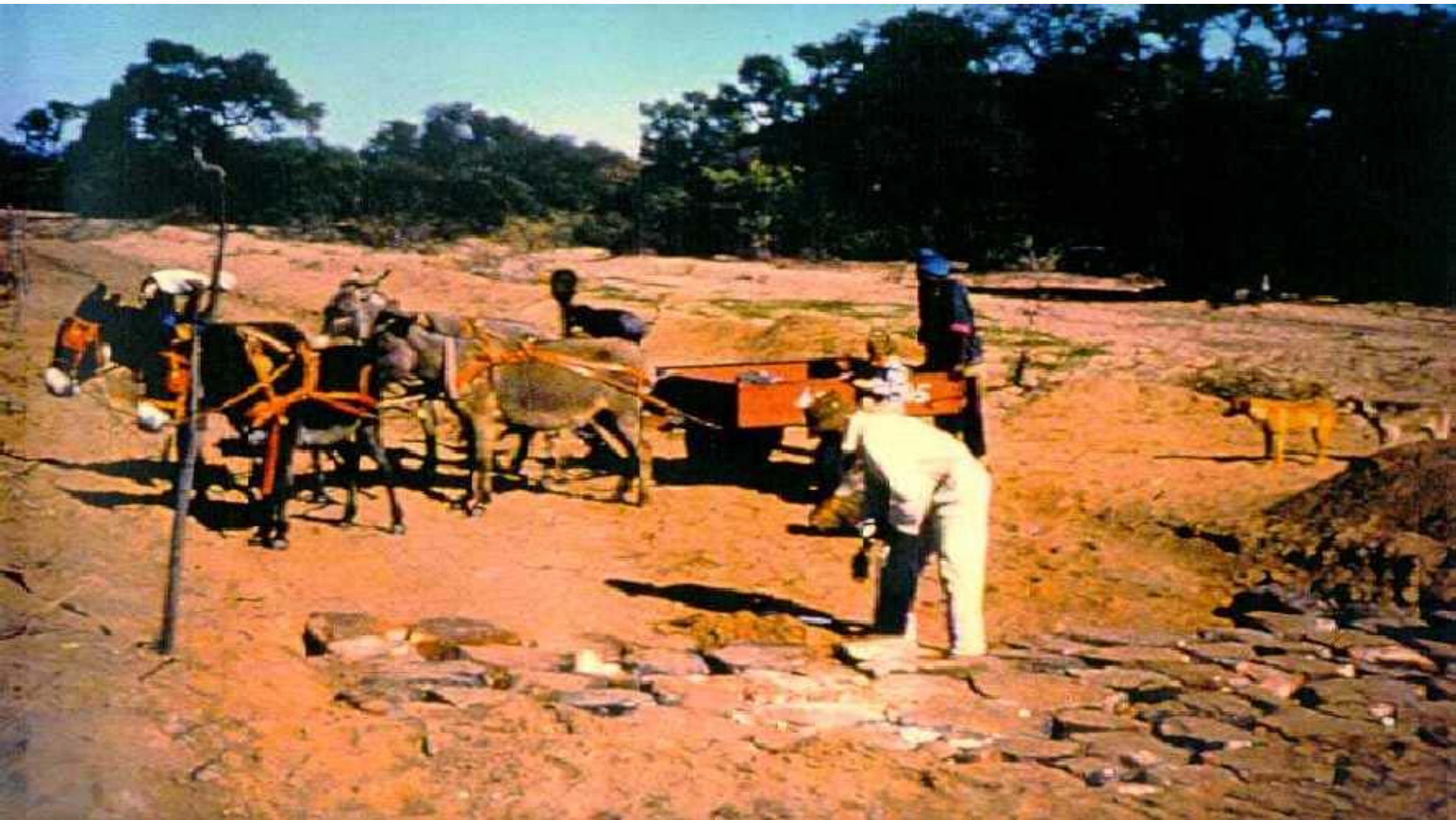


Sekhukhune: Rubble masonry culvert





Animal drawn haulage



Drift: Stone packed

Substitution (2): Water and Sanitation

Example from South Africa

Water and sanitation facilities (simple and complex)

Oxidation / Maturation ponds

Engineered and Organised by ***James Croswell***









Maturation Pond 20 000 m³

Increase Labour Intensity

Four Methods

1. Substitution
2. **Revival**
3. Modification
4. New



Revival: Waterbound Macadam Base (Ethekewini)



Revival: Waterbound Macadam Base (Ethekewini)



WBM Base Victoria West (Hattingh)



N 1 Matoks to Machado: WBM Base



Provincial Road in Free State Province

Increase Labour Intensity

Four Methods

1. Substitution
2. Revival
3. **Modification**
4. New

Modification

Bitumen Emulsion
in
Slurry bound Macadam
Base



Bitumen emulsion in slurry bound base

Increase Labour Intensity

Four Methods

1. Substitution
2. Revival
3. Modification
4. New

New 1

Carefully engineered use
of
Sulphonated Petroleum Products

New 2a

Convert base layer technology
to
surfacing technology
equivalent to hot-mix asphalts

New 2b

Development of set of plant
costing R200 000

Equivalent to Mobile Asphalt Plant
costing R2 000 000



Johan Hattingh and his Team



Patented spinning beam



Spinning beam on surface layer

Re-design (3): Community and Food

- In addition to categories listed above under Roads and Stormwater and Water and Sanitation:
 - Dams and Spillways
 - Canals and channels
 - Spring protection
 - Terracing
 - Gabions
 - Fencing
 - Site clearance
 - Fire breaks
 - Food storage facilities, including silos and warehouses

Re-design (4): Other (i)

- Clearing, maintenance and signage of hiking / mountain biking routes
- Community paths and cycle tracks
- All types of airfields / landing strips
- All types of buildings and structures
- Walls
- Hawker facilities and supporting civil infrastructure
- Production of building and construction materials

Re-design (5): Other (ii)

- Production of building and construction materials
- Production of road furniture such as bollards, dust-bins, separation barriers, either in in-site yards, or by small local entrepreneurs

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Franchise and Spinning Beam
(Hattingh)

Re-engineering(3): 'Process'

Plan a long-term ***Programme***

Re-design for Labour-intensive

Revise Contract and Documentation

Extensive and thorough Training

Start small expand gradually

Long-term, large-scale *Programmes* of Skills Development

What is a *Programme*?

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Re-engineering (3)
Programme: S - Curve for Development

McCutcheon

Re-engineering
for
Skills Development and Employment

Expanded Public Works Programme 2004/05 to 2013/14

- Objectives of EPWP
- Labour-intensive Construction: Definition (See Mutual Aid 1)
- Legislation and Regulation
- EPWP Trends Analysed using Data from EPWP Quarterly Reports
- Evidence from South Africa and elsewhere
- Reasons for low labour-intensities
- Opportunities Foregone
- Mega-projects

Sowetan

19 May 2004

Mbeki's bold jobs plan

President vows to
make a better life for
all the people of SA

The Star
Business Report
19th May 2004

Initiative aims to create skilled workforce

**President launches
public works scheme**

EPWP Definition 2004

- Nation-wide programme which will draw significant numbers of the unemployed into productive work: gain skills...increase their capacity to earn an income
- To utilise public sector budgets to reduce and alleviate unemployment
- Increase labour intensity of government infrastructure projects
- Task-based payment for labour-intensive works
- Provide needed public goods and services, labour-intensively, at required standards, through mainly public sector resources and public and private sector implementation capacity.

Legislation

- Amendments to Basic Conditions of Employment Act 2002
- Division of Revenue Act 2004 (DoRA)
- Guidelines for the Implementation of Labour-intensive Projects under the EPWP

Division of Revenue Act: ***Mandatory***
Categories of Infrastructure to be conducted Labour-
intensively

- o Low-cost, low-volume roads
- o Stormwater drainage
- o Pedestrian and Cycle Paths
- o Trenches

EPWP Phase 3: Objective

To provide work opportunities and income support to poor and unemployed people through the delivery of labour-intensive public and community assets and services, thereby contributing to development.

Major Positive Conclusions

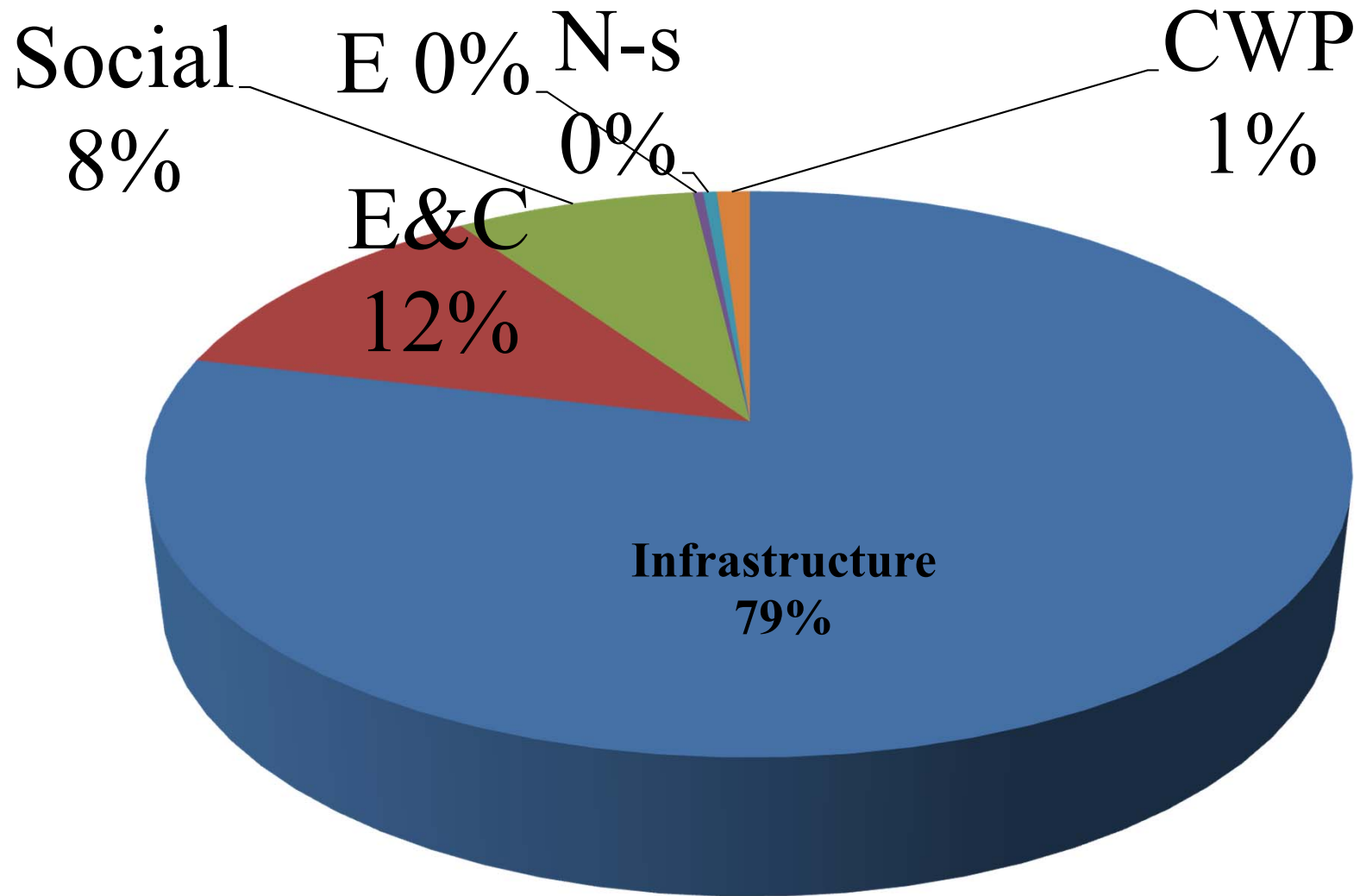


EPWP is a visionary component of South Africa's strategies to alleviate poverty, generate jobs and skills

The beneficiaries and stakeholders were very positive about the opportunities for work and training, and about the assets and services provided through EPWP. And they want more, much more

Individual (*pre-existing*) success stories

EPWP Expenditure
Lion's Share to Infrastructure: 79%



EPWP: Labour-intensity in the Infrastructure Sector

Labour-intensity: 10% should be at least 30%

CRITIQUE

Overarching Reasons

External Reasons

Internal Reasons

Overarching Reasons

South Africa did not establish a long-term integrated 'in house' programme of construction and training.

It decided that delivery should be via *small contractors / contract*

External Reasons

Existing Industry based on Heavy Equipment

Lack of understanding of all concerned

Internal Reasons (1)

No linked programme of Training and Construction

Drift to Social Welfare

Insufficient Re-engineering

Mandatory Division of Revenue Act conditions for use of
Municipal Infrastructure Grant simply ignored.

Ditto Provincial Infrastructure Grant

Difficulties with Small Contractors and Contract

Internal Reasons (2) Detail re Contract

- Projects were simply **labelled** labour-intensive but conventional methods were used: the **mandatory** conditions set by the Division of Revenue Act for access to the Municipal Infrastructure Grant (&PIG) were **simply ignored**
- Some of the contracts included clauses stating that labour-intensive methods must be used but the **clauses** were simply **ignored**
- Contracts were awarded to contractors who were not able to use labour-intensive methods
- **Tokenism**: in order to raise numbers, people were hired to sit alongside the site where the machines were working
- **Ineffective use of machine-intensive, conventional methods**, resulted in **costs varying from two to four times normal costs**. Proportion of expenditure going to labour was even less than under conventional construction

Internal Reasons (3) Detail re Contract

- It is of particular importance that:
 - ***No enforcement*** of contractual conditions was made

Absence of Technical Training

Training was specified as essential in the 28 June 2004 EPWP Consolidated Programme Overview and Logical Framework.

- 8.2 Training capacity, materials and information dissemination
- *8.2.6 Establishment of a National Training Centre for labour-intensive construction*
- ...it has been identified that a public institution needs to be established
- ...Once off capital injection of R2 million

A dedicated Training Centre has still not been established

Opportunities Foregone 2004/05 to 2013/14 (One)

- o At 10.1% Labour-intensity.
- o Full Time Equivalents: 781 433.
- o Wages R13 007 Million.
- o Labour-intensity could have been 30% for *Mandatory* types of infrastructure.
- o Full Time Equivalents would have risen to: 2 321 888.
- o Wages to R38 634 Million.

Opportunities Foregone 2004/05 to 2013/14 (Two)

- o At 10.1% Labour-intensity: Full Time Equivalents: 781 433; Wages 13 007 Million.
- o If Allocated Expenditure had actually been spent at the 30% labour-intensity for the types of infrastructure for which it is **MANDATORY** to use labour-intensive methods: Full Time Equivalents would have risen from 782 433 to 9 807 944
- o ***One Million a Year instead of merely 65 000.***
- o Wages would have risen from R13 007 Million to R162 472.5 Million

Lost Opportunities for both Skills Development and Employment

- Where else in the major economy are there opportunities to generate work opportunities for the poor and unskilled?
- Using money that has already been allocated for expenditure?

Mega-Projects

- Gautrain Metro Rail Budget: R27 Billion
- New 4000MW Power Station: R44 Billion
- **Time to plan and construct at least 10 years**

Long term programmes linking training and construction

- Successful implementation requires:
 - *Modification to the normal project cycle*
 - *Meaningful community participation well ahead of the start of construction*
 - *A pre-feasibility study to assess whether the project is amenable to making greater use of local resources (and the other socio-economic factors stated in the call for tenders)*
 - *Radical changes to design, specification, detail and other contractual documentation.*
 - *Training, Training, Training*

MAIN REASONS FOR FAILURE

Lack of understanding of Labour-intensive construction and principles

Existing heavy-equipment based industry

Absence of practical planning and training

Inappropriate design, specs and documentation

Lack of Enforcement

Main Lessons for South Africa (One)

- Establish 'in-house' linked *Planned Programmes* of Training and Construction.
- In principle: use model which has proven successful elsewhere in sub-Saharan Africa.
- *Huge potential for deepened rural development, especially in low volume roads, drainage and maintenance.*
- Local model: Greater Sekhukhune, Limpopo Province
 - Local Authority, Planned Construction Programme linked to thorough *Training of 'hands-on' Single-site and Multi-Site Supervisors (the 'missing middle')*

Main Lessons for South Africa (Two). Since SA is probably going to rely on Contractors and the Contract (1)

- Short-term:
 - *Re-engineer Product and Process*
 - Re-design categories of Infrastructure to be built by labour-intensive methods: in particular all Earthworks Operations (ELHUS)
 - Prepare proper contract documentation: specifications, contract clauses, Bills of Quantities.
 - Careful Selection of Contractors
 - Enforce the contract

Main Lessons for South Africa (Three). Since SA is probably going to rely on Contractors and the Contract (2)

- Medium to Long-term:
 - Establish proper linked training programmes for ‘hands-on’ Site Supervisors and Multi-Site Supervisors. Select from the best and keenest for further training as Contractors.
 - *Legislation to enforce exists. Enforce it!*

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Source: NEF 1994

Re-engineering

Critical importance of the

“Hands-on” Site Supervisor

The ‘Missing Middle’

Main Lessons for Africa (One)

- Follow the successful models which were so successful in Kenya, Botswana and Lesotho from the mid 1970s to the mid 1990s.
- i.e. Establish ‘in-house’ linked *planned Programmes* of Training and Construction.
- Extensive research and field experimentation in South Africa has demonstrated that high-standard infrastructure can be efficiently constructed by labour-intensive methods

Main Lessons for Africa (Two)

- If you decide on the independent contractor route
- Take note of the SA experience

The Four LIES

- It will take *too long*
- It will cost *too much*
- Product will be *low quality*
- It will be *too difficult* to manage

CONCLUSIONS

- Labour-intensive construction is sophisticated
- The hands-on site supervisor is essential for cost effective and efficient delivery
- Quality training is needed at all levels
- Long-term programme approach must be used, that integrates construction and training

Remember

- In Kenya, Botswana and Lesotho:

Long-term, large-scale, programmes of labour-intensive road construction have been implemented

- Labour-intensities of over 50% of direct construction costs have been achieved during construction of the type of road, for which it was supposedly mandatory to use labour-intensive methods in South Africa's EPWP

Long-term Development
is NOT
Short-term Relief

Thank you



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Thank you for attending.



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