

R B Watermeyer

# Community-based construction: A route to sustainable development and job creation

## Synopsis

Community-based construction can be used to sustain development and create jobs in communities. This paper discusses community-based construction in the light of sustainable development and community participation in the construction of community assets. It reviews the processes involved as well as the economic viability of such projects.

## Samevatting

Gemeenskapsgebaseerde konstruksie kan as 'n middel dien waardeur handhaafbare ontwikkeling bewerkstellig en arbeidskepping binne gemeenskappe voortgehelp kan word. Hierdie verhandeling beskou arbeidsgebaseerde konstruksieprojekte in die lig van handhaafbare ontwikkeling van, asook gemeenskapsbetrokkenheid by die daarstelling van fisiese gemeenskapsbates. Dit bied 'n oorsig oor die betrokke prosesse en oor die redes vir die lewensvatbaarheid van sodanige projekte.



**Ronald Watermeyer** *PrEng* graduated in Civil Engineering from the University of the Witwatersrand in 1978. As a bursar, he entered employment with Transnet, working first in the central yard construction offices and then in structural design. In July 1988 he joined consulting engineers Soderland and Schutte Inc, becoming a director in 1990. Since 1988 he has been involved in the design and implementation of civil engineering labour-based/community-based projects and the creation of a contractor development programme.

## Introduction

Sustainable development (SD) is a self-initiated and self-sustained development process based on the needs and resources of the community (while minimizing the reliance on external resources), and the goal is the restoration of individual identity and dignity and the promotion of people's participation in every area of the developmental process. Therefore, in its truest sense, SD is a developmental process initiated by the people themselves. What is most needed (from outside) is to facilitate and encourage people (but NOT to intervene) to organize themselves for such efforts, which will eventually help them to attain a better livelihood. It is therefore of utmost importance to help the communities by enabling them to initiate such a process of development rather than providing ready-made packages.

In this respect, a 'sustainable community development approach' should be based on the following convictions:

- The process of 'development' should be self-sustaining in the long run
- The very process of 'development' must be initiated by the 'people' themselves
- The roles of 'outsiders' must be time-bound and their scope of assistance limited to the provision of alternatives and, if necessary, towards the provision of 'seed capital', including human capital
- Dependence on 'outside' resources must be minimized as far as possible (Pant, 1991)

For sustainable development work, it is not important how we define a community, but how the people we try to serve regard themselves as being a community. People themselves know best on whom they are dependent, with whom they can communicate, with whom they meet to alleviate individual needs and social or common needs. This also applies to participation (Ymker, 1991).

Community participation is based on the premise that in a community there is knowledge, skills, attitudes and resources on which people can build (Ymker, 1991). The role of development groups should be to empower people to make better use of these and to assist them to improve their quality of life. Development should be seen as a process rather than an end in itself.

Community participation, in the context of the provision of infrastructure, can range from taking part in meetings to decide upon which services are required or where a service needs to be constructed, to becoming involved in the actual construction of such a service. Within the range of participation opportunities there are also degrees to which communities can be involved. At one end of the spectrum this could include the undertaking of a needs assessment to ascertain what is actually required and what the associated priorities are, while at the other end of the spectrum the community could, if provided with the necessary developmental support, be mobilized to construct their own infrastructure (Watermeyer, 1993b).

Community-based construction practices embrace the above-mentioned principles of a sustainable community development approach and can be used effectively in public works and housing programmes to maximize the benefits accruing to a particular community through the creation of assets. This method of construction, in addition to addressing the aspect of job creation, ensures that skills and competencies are developed while assets are being constructed. Competencies are developed not only in the technical fields, but also in the administrative, managerial and commercial fields. Community-based construction also ensures that some of the profits made in the construction of assets remain within a community to enable that community to build up its resources.

Accordingly, projects involving the creation of assets in public works and housing programmes should be structured to promote sustainable development. In practice this means that projects should be structured so as to:

- Create employment opportunities
- Promote community involvement
- Impart technical skills to the unskilled and semi-skilled members of the community

- Transfer administrative, commercial and managerial skills to the community
- Retain, as far as possible, the funds expended on the project within the community
- Develop contractors and entrepreneurs from amongst the community (Watermeyer, 1993b)

Projects that address these aspirations allow the resources of the community to be built up in an endogenous manner (Davis, 1992), ie to be grown from within.

### Community-based construction

Community-based construction may be defined as 'the use of labour-based technologies and labour-intensive methods on projects in which the community is, in addition, involved in the commercial, managerial and administrative aspects so as to maximize the amount of funds retained within the community and to transfer skills and competencies to the community' (Watermeyer and Band, 1993).

*Community-based* construction in a sensitive and non-imposing manner aims at the use of labour-based projects to promote the emergence of local entrepreneurs who, with adequate technical, commercial and financial support and instruction, can in due course become fully fledged contractors/subcontractors, should they so desire. Community-based construction practices make use of technologies that optimize the use of labour and methods of construction that maximize the use of labour in a cost-effective manner, and implement these employment-intensive options in construction by using small-scale contractors.

In community-based projects, members of the community can also become involved in the:

- Operation of stores facilities
- Support provided for local contractors, eg administration, monitoring of progress
- Transportation of materials to local labour-only contractors
- Manufacture of certain materials
- Supply of minor materials, and
- Security of the site

and, in so doing, be meaningfully exposed to management and administrative activities and further benefit from the employment and entrepreneurial opportunities they offer.

### Conventional approach to construction of services

Traditionally, township services are constructed by established plant-based contractors who have all the necessary resources, viz:

- Finance for salaries and wages
- Credibility in commercial circles to obtain sureties, to open accounts with suppliers and to hire plant
- Managerial, commercial, technical and administrative skills required to secure and execute contracts (Watermeyer, 1993a)

Furthermore, such contractors have a stable labour force, generally recruited from a particular area outside the area of the beneficiary community. This means that communities participate only as casual labourers and, consequently, a relatively insignificant percentage of project expenditure is retained by the community. At the same time, no provision is made in the industry for labour-only subcontractors as is the case in the building industry. Accordingly, community participation in projects of this kind is very restricted.

### Barriers to entry

The barriers that prevent local entrepreneurs or small building contractors in a local community from engaging in civil engineering construction are:

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

The above-mentioned barriers to entry can be reduced by:

- The employment of labour-based technologies
- The provision of access to resources that are lacking, eg bridging finance, materials, plant, etc
- The provision of developmental assistance
- The structuring of contracts

Thus if communities are to be engaged as contractors in construction, changes in both the construction method and the construction process are required (Watermeyer, 1993a).

### Development support required for emerging contractors

The conventional approach to construction by calling for tenders and engaging a SACEC contractor does not produce black civil engineering contractors owing to the absence of black members. Neither will the insistence that local contractors be engaged as subcontractors on a project necessarily elicit a response from the community, as this approach presupposes the existence of such contractors who both have the necessary resources and are capable of executing the relevant work; nor will the inclusion of clauses in contract documentation that aim to restrict the use of plant or make the use of local resources obligatory necessarily involve communities in the managerial, commercial and administrative aspects of construction.

Local entrepreneurs from underdeveloped communities cannot engage in construction without developmental support and the acquisition of external resources. The question that then arises is how should the support be rendered?

Various methods to implement labour-based technologies and labour-intensive methods and to facilitate the involvement of entrepreneurs from targeted communities are presented in the report commissioned by the National Housing Forum entitled *The development of small-scale enterprises, skills, entrepreneurship and employment opportunities through the provision of housing*. In this report, two approaches are recommended for engaging local contractors in construction projects, viz the managing contractor and the development team approaches. The development team approach ensures that the ownership of the project remains with the community and readily allows the community to participate in construction and materials management and other construction-related activities. The managing contractor approach, on the other hand, is somewhat restricted in scope and permits the community only to own subcontracts. The contractor support mechanisms in the two approaches are similar, however. To illustrate the support mechanisms and to demonstrate how communities can be meaningfully engaged in as wide a range of construction activities as possible, the development team approach will be used to illustrate the necessary developmental support required.

### The development team approach

In the development team approach, experienced and suitably qualified persons assist local community-based contractors with the administration and management of their contracts, offer technical training, engage specialist contractors and supply the necessary materials and equipment. In addition, the development team employs and trains members of the local community to run stores facilities, monitor progress, assist with administration, etc. Normally, the local contractor enters into a contract with the client/funding body and the development team is appointed directly by the client on a fee basis. The development team may be regarded as construction facilitators who arrange to provide resources that the contractor lacks. In a community-based project, the development team must ensure that certain specific functions are carried out, normally by the following individuals, who assume distinct responsibilities:

- The design engineer
- The engineer
- The construction manager
- The materials manager

Experienced contractors, project managers or consulting engineers may perform the duties and assume the responsibilities of the construction and materials managers. However, the design and supervision of the works, ie the duties and responsibilities of the design engineer and the engineer, must be undertaken by professional engineers or technologists.

It should be noted that the construction and material managers are appointed by the client on a fee basis in terms of a scale of fees. Thus the contractor is motivated by profit to complete his contract successfully, whereas the development team is motivated by seeking to secure another appointment. Model forms of agreement have been written for the ap-

pointment of construction and materials managers (Soderlund and Schutte, 1994).

#### Support provided by construction and materials managers

The developmental support provided by the construction and materials managers may be summarized as follows:

- |                      |   |
|----------------------|---|
| Construction manager | <ul style="list-style-type: none"> <li>- Offers advice, practical assistance and training</li> <li>- Provides plant other than small tools</li> <li>- Arranges for specialist work</li> <li>- Arranges for payment of fortnightly/weekly wages</li> <li>- Arranges transportation of materials to site</li> </ul> |
| Materials manager    | <ul style="list-style-type: none"> <li>- Provides all material</li> </ul>   |

In terms of the model form of agreement, the construction manager is required to *advise, assist and train on-the-job the contractor in the execution of his contracts and to this end shall make visits to the site at such intervals as he deems appropriate during the various stages of construction in order to ensure that the contractor makes satisfactory progress, shows technical competence in the execution of all aspects of the works and generally fulfils his contractual obligations. The construction manager shall procure the services of site staff, as necessary, to assist him and provide continuous support to the contractor in order to ensure that the client's objectives are achieved.*

The construction manager cannot, however, *ensure the performance of the contractor, nor guarantee against any failure by the contractor to perform his work in accordance with the contract* (Soderlund and Schutte Inc, 1994).

The construction manager's function is therefore to minimize the client's contractual risk and to meet the client's objectives of *having the works constructed to specification within a specified period and a given budget using community-based contractors and labour-based construction practices* (Soderlund and Schutte Inc, 1994). Thus the client has the assurance that the local small contractor, by relying on the support provided by the construction manager, will have the necessary skills available to complete the contract adequately (Watermeyer and Band, 1994).

It should be noted that the construction and materials managers carry professional indemnity insurance, which can be called upon in the event of negligence on their part.

The support provided is flexible and can be varied depending upon the needs of the community, eg if the community is capable of procuring the materials, then there would be no need for a materials manager.

#### Structure of contracts

In addition to the support offered by the development team, contract documentation is structured so that:

- Tenderers may tender on the basis of rates or a lump sum
- No sureties are called for
- Insurances are arranged for contractors, and
- Fortnightly wages may be paid out to contractors upon completion of a fortnight's work

Standardized specifications (S 100 series) based on the SABS 1200 series have been developed to adequately assign risk and responsibility and to describe payment items (Soderlund and Schutte Inc, 1994; Watermeyer, 1993a).

#### Risk to client

The risk to the client is probably less than that on conventional contracts, in spite of the fact that no sureties are called for (Watermeyer and Davis, 1993). This is due to:

- Smaller contracts of short duration
- Labour-only contracts
- Contractors being paid only for work done
- A 10 per cent retention being applied to all contracts
- The structure of the developmental support provided
- Developmental team members carrying professional indemnity

#### Training

Training is predominantly 'on-the-job', with infrequent formal after-hours training sessions. Members of the community are therefore trained

on an 'earn and learn' basis, the cost of which is nominal and forms part of the construction cost. However, a formal training phase is also necessary to ensure that potential contractors are able to fend for themselves in the open market. Training provided may be summarized as follows:

- How to tender
- On-the-job training (how to execute contracts)
- Formal (how to develop a business)
- Mentorship

The aim of any formal training course that may be presented should be to impart skills and competencies to those at present operating in the informal sector to enable them to enter the mainstream of the economy.

#### Projects undertaken

The development team approach has been implemented on various projects in the Witwatersrand area and Eastern Cape. These projects have included the construction of sewer and water reticulations, the construction of roads (waterbound macadam bases) and the electrification of a township (low voltage subsurface cabling).

At the end of January 1994, in Soweto alone, approximately 215 km of secondary water mains had been laid, 19 500 erven had been replumbed and 30 000 m<sup>2</sup> of roads had been upgraded by community-based contractors at a project cost of approximately R44 million. In Ibhayi subsurface low voltage cable for some 14 000 erven has been laid.

#### Cost

The cost of community-based projects, including the cost associated with the developmental support provided, has been found, with the exception of road construction, to be comparable with that of conventional plant-based construction on various projects where the development team approach has been adopted (Watermeyer and Band, 1994; Watermeyer et al, 1994), viz:

- Upgrading of secondary water mains (Soweto): 15 to 30 per cent less expensive
- Internal sewer and water reticulation for a housing development (Sandton): Around six per cent less expensive
- Installation of low voltage cables (Ibhayi): 16 to 19 per cent less expensive

In all the above-mentioned projects, tenders have been awarded to community-based contractors, whose tender prices are not normally more than 10 per cent below the construction manager's estimated value. In all cases, the estimate used for tender adjudication purposes is based upon the prevailing minimum wages laid down in the Wage Order for Civil Engineering Works for casual employees. Community-based contractors therefore have the potential to remunerate their workers in accordance with the prevailing minimum hourly rates on these projects. This has been achieved by changing the cost structure of contracts by the approach adopted.

The typical cost structure of traditional (conventional) contracts and community-based contracts for the provision of infrastructure may be compared as follows:

- |             |   |
|-------------|---|
| Traditional | <ul style="list-style-type: none"> <li>- Preliminary and general items</li> <li>- Labour @ cost + overheads + profit</li> <li>- Materials @ material price + waste allowance + overheads + profit</li> <li>- Plant @ cost + overheads + profit</li> </ul> |
|-------------|---|

Contract price = sum of above

- |                 |  |
|-----------------|--|
| Community-based | <ul style="list-style-type: none"> <li>- Disbursements (provision and maintenance of site facilities, transportation for site staff, printing, computer costs, etc)</li> <li>- Management fees and site staff charges</li> <li>- Materials @ cost + waste allowance - settlement discount</li> <li>- Plant @ cost</li> <li>- Labour @ cost + nominal overheads + profit</li> </ul> |
|-----------------|--|

Contract price = sum of above

Norms expressed as a percentage of the cost of the works:

<i>Traditional</i>	
Ps & Gs	15
Profit on materials and plant	<u>6</u>
	21%

### Community-based

Disbursements		3,0
Site/stores staff charges		12,0
Management fees	- materials	3,0
	- construction	4,0
		<u>22%</u>

From the above analysis, it can be seen that community-based construction should be cost comparable with traditional construction and possibly cheaper, as community-based contractors have lower overheads while materials and plant are supplied at cost to the project. In effect, profit on materials and a conventional contractor's overheads are traded for development support costs.

### Manufacture of materials and construction of buildings

Although community-based construction has been discussed only in the context of the construction of infrastructure, the support structures can equally be applied to the manufacture of materials, eg precast concrete products, and the construction of houses, crèches, schools, community centres, etc (Watermeyer and Band, 1994).

### Employment opportunities

Traditionally, the construction industry has been viewed as an industry that produces a high rate of employment per unit of expenditure. In South Africa, its ability to generate employment per unit of expenditure is surpassed only by that of the clothing and the textile industry. It is therefore not surprising that job creation initiatives are linked to this industry.

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

The current cost per man-hour of employment on projects involving the construction of water pipelines and surfaced roads in Soweto, where community-based construction practices are employed, ranges from R17 to R19 (Watermeyer et al, 1994).

Approximately 15 per cent of the man-hours involved on infrastructure projects relate to construction and materials management activities. On projects where community-based construction practices are employed, the targeted community may be engaged in a significant proportion of these man-hours.

### Cost retained by the community

The amount of construction cost retained by the community gives an indication of the degree to which entrepreneurship and small-scale enterprises are promoted in the community and is a direct measure of the benefit accrued by the community from the project as well as that of economic empowerment (Watermeyer et al, 1994).

In community-based construction projects in Soweto, where materials are not manufactured by the community, the amount retained by the community varies from 37 to 50 per cent, depending on the cost inputs relating to materials. This is achieved through the community's involvement in the construction contracts (25 to 33 per cent), transportation of materials (2 to 9 per cent), construction management (6 to 7 per cent) and materials management (2 to 3 per cent) (Watermeyer, et al, 1994). In house construction, the cost retained by the community by means of community-based construction practices can be in excess of 40 per cent (Watermeyer and Band, 1994). Where communities engage in the manufacture of materials, these percentages will increase.

### Community participation

Community-based construction is implemented in four distinct phases (Watermeyer and Band, 1993), viz:

- Stage 1: Planning and community liaison
- Stage 2: Design and pre-construction stage
- Stage 3: Construction
- Stage 4: Post-construction

The community can be meaningfully involved at each and every stage.

To both involve communities in the process and ensure that communities derive the maximum benefit from construction projects, facilitation is required to bring all relevant community organizations, associations and non-profit organizations whose constituents are either affected

by the project or may derive some benefit from the project together and constitute a body to represent the community. This body and the developer (which may be a local or regional authority or a private developer) should then enter into a development compact, ie an agreement that lays down a procedure that is to be followed from Stage 1 to Stage 4. In terms of this compact, the developer should, prior to commencing with the detailed aspects of Stage 2, agree to commission a pre-implementation investigation of the project, so as to inform the community of the developmental opportunities and constraints it presents. Upon completion of this investigation, the developer should present representatives of the community with a report that should, inter alia, set out:

- Opportunities and constraints
- The contribution that local resources can make to the project
- The local skills that are available
- Training requirements
- The proposed nature, structure and composition of developmental support that will be provided for emerging contractors and local enterprises
- The manner in which local labour will be engaged on the project
- The potential benefits that may accrue to the beneficiary community, including those relating to employment opportunities, the acquisition of skills and economic empowerment

The community representatives should formally comment on the report and agree upon the approach that is to be adopted before Stage 2 is completed.

Community representatives, in the initial stages of the project, can in this manner exercise more influence over the project than would normally have been the case and can advise on community requirements and identify local resources. As the project develops and is implemented they can, however, play a constructive role in observing operations to ensure transparency and accountability and attend to grievances as they arise. In this manner communities can actively participate in both project implementation and physical construction in a meaningful manner.

### Conclusions

Community-based construction is a cost-effective method of achieving the goals of sustainable development in public works and housing programmes and is effective in linking job opportunities for targeted communities to the creation of assets in a non-prescriptive way. This form of construction can be implemented with short lead times (Watermeyer, 1993a) since the necessary systems (modus operandi), contract documentation, standardized specifications, training manuals, model form of agreement for the appointment of the development team and training programmes have been developed over the last six years on various infrastructure projects (Soderlund and Schutte, 1994; Watermeyer, 1993a, Watermeyer and Band, 1994).

The process of community-based construction is a necessary part of the answer to the challenge to empower communities to actively participate in construction projects and to realize the developmental opportunities they present. It involves the changing of the construction process to make it suitable for labour-based construction technologies, whilst ensuring that there is no reduction in the quality of the end product and that the process is cost-efficient. In addition, the delivery systems aim to maximize, within specific localities:

- Job creation
- Use of local resources
- Local income generation, and
- Training

Community-based construction projects that empower communities to build up their own resources and enable communities to become involved in construction activities require commitment by all the participants (Band, 1993), namely the:

- Community
- Development/professional team members
- Client/funding body, and
- Community-based contractors

Projects where each player energetically and diligently pursues his obligations and functions will enjoy successful outcomes and comply with the five absolutes of project management (Band, 1993), namely:

- Completed within budget

- Completed on time
- Completed to the correct quality
- Skills and competencies are transferred to the community, and
- Project funds left in the community are a maximum

provided, however, that effective communication channels remain open between all at all times (Watermeyer and Band, 1993).

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## Discussion on papers

**Written discussion on the technical papers** in this issue of the *Journal* will be accepted until 30 April 1995. This, together with the authors' replies, will be published in the Second Quarter 1995 (June) issue of the *Journal*, or the issue thereafter. For the convenience of overseas contributors only, the closing date for discussion will be extended to 31 May 1995. Discussion must be sent to the Directorate of SAICE.

Such written discussion must be submitted in duplicate, should be in the first person present tense and should be typed in double spacing. It should be as short as possible and should not normally exceed 600 words in length. It should also conform to the requirements laid down in the 'Notes on the preparation of papers' as published on the inside back cover of this issue of the *Journal*.

Whenever reference is made to the above papers this publication should be referred to as the *Journal of the South African Institution of Civil Engineers* and the volume and date given thus: **J SA Inst Civ Eng, Vol 37, No 1, First Quarter 1995.**