Academic papers

Community-managed infrastructure facilities

A.B. Ngowi

The author

A.B. Ngowi is based at the Department of Civil Engineering, University of Botswana, Gaborone, Botswana.

Abstract

The design and construction of infrastructure facilities such as road network, water supply and sewage disposal in Botswana, have often been done in a top-bottom fashion where the government or local authority decides what is good for the community. While the design and construction of infrastructure facilities require technical knowledge, heavy equipment and proper supervision, their management hardly requires these resources to the same extent. This offers the beneficiaries of the facilities an opportunity to manage their day-to-day operations and maintenance. Reports on an approach adopted to engage the community in the management of local road network, water supply and sanitation in three major villages in Botswana. It analyses the method previously employed in managing these facilities and outlines the benefits which will accrue when this approach is fully operational. Concludes by underlining the fact that, for community-managed facilities to work, the people in the community need to participate in all the stages of the project (i.e. planning, design, construction and eventually maintenance).

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Introduction

In order to function properly, communities whether urban or rural require a complex network of utility services including electric power, water supply, communications and other services such as roads, railways, and drainage. The facilities used to transmit these services from and including their sources to the point of use or disposal are collectively known as infrastructure facilities. The importance of infrastructure facilities to any community hardly needs to be emphasized. They feature in the lives of the members of the community from the water they drink to their connection to the outside world. The type and size of these facilities will vary greatly, based on the character and size of the community as well as the activities carried out.

For very small rural communities, these facilities may be provided independent of one another, in which case a drilled well for water supply and conveyance pipes is installed on a route which is independent of the one used to install electric power transmission (Pribble, 1984). However, in larger communities where several connections are necessary, these facilities need thorough planning so as not to scatter them too widely and also to facilitate easy maintenance. The common way in which this is achieved is to locate them within the right-of-way reserved for the various major and minor roads transversing the community. The right-of-way of the road network will thus become, in effect, the basic corridor system, with the main lines of the various facilities being routed along the major roads and branches and distribution system routed along the minor roads (Pribble, 1984).

The laying of the facilities in an orderly manner will greatly facilitate maintenance and repair work and the task of extending the system as the community grows. In order to prevent unnecessary removal and repair to paving, it is essential that the facility installations be completed on an incremental basis and completed before paving of streets and side-walks is undertaken. It is necessary therefore, to subdivide the corridor into subcorridors, allocating a separate space to each facility. Subcorridors for all facilities should be provided on both sides of the streets and roads in order to allow for flexibility in the final design (O'Flaherty, 1987).

Equally important for infrastructure facilities is the welfare of the beneficiaries. The

government of Botswana, as most African governments, has often implemented development projects in a top-down fashion in which local communities, which are the main beneficiaries of the projects, are rarely consulted. In this way most development schemes particularly infrastructure projects, while bringing about huge physical changes, fail to solve underlying economic and social problems and are often opposed by community groups or are received reluctantly. In Flood and Jackson's (1991) argument the community groups are opposed to these schemes because government's implementation of plans are "mechanistic". They give very little attention to human relations. Since individuals operate most effectively when their social and psychological needs are catered for, the neglect of these needs demotivates community groups.

Some developing countries have come close to involving communities in their development projects through the use of labour-intensive technologies. However, the emphasis in such projects as observed by Ayari (1964) is to tap the under-employed and unemployed labour and bring it to the mainstream of the national economy. Their intention is not necessarily to hand over power to the communities.

Governments need to reverse the way they implement development programmes if the potential of the local communities in managing and maintaining the finished projects are to be achieved. Governments should focus on community motivation strategies. Issues of motivating community participation in decision making, democracy and various other community enrichment strategies should be part and parcel of development programmes. Using Flood's (1993) proposition on the definition of a customer or client, the communities are part and parcel of the external and internal clients. Those people from the community directly employed in the project are part of the "internal customer" group and other people within the community, benefiting from the development project are part of the "external customer" group. In other words, all community groups are client. For the community (customer/clients) to support the development, the development must satisfy their requirements, hence the notion that "participation" needs to be maintained. To a large extent, this can be done through encouraging community involvement, and choice of appropriate technology.

Community participation

In planning projects, governments often tend to pre-empt the initiatives that beneficiaries might have taken. In such cases, the latter can play only a reactive role. Projects can, however, be designed to encourage beneficiaries to initiate action. There are cases where beneficiary groups which seemingly failed in some projects went on to initiate other projects on their own and with greater success because they learned from the earlier mistakes (Hirschman, 1984). This requires governments to encourage community participation which, according to Cernea (1985), is "an active process by which beneficiary/client groups influence the direction and execution of a development project with a view to enhancing their wellbeing in terms of income, personal growth, self-reliance or other values they cherish". In the context of development, community participation may be viewed as a process that serves one or more of the following (Paul, 1987):

- In the broadest sense, community participation may be thought of as an instrument of empowerment. Accordingly, any project or development activity is then a means of empowering people so that they are able to initiate actions on their own and thus influence the process and outcomes of development.
- Community participation may serve a more limited objective of building beneficiary capacity in relation to a project. Thus, beneficiaries may share the management tasks of the project by taking on operational responsibilty for a segment of it themselves.
- Community participation contributes to increased project effectiveness when the involvement of beneficiaries contributes to better project design and implementation and leads to a better match of project services with beneficiary needs and constraints.
- Another objective of community participation is the desire to share the costs of the project with the people it serves. Thus, beneficiaries may be expected to contribute labour, money or undertake to maintain the project.
- Community participation may improve project efficiency. Project planning and implementation could become more efficient because of timely beneficiary inputs. Community participation could be used to promote agreement, co-operation and interaction among beneficiaries, and

between them and the implementing agency of the project so that delays are reduced, a smoother flow of project services is achieved, and overall costs are minimized.

These objectives may overlap in real life project situations, whereby a project may simultaneously pursue several objectives. While community participation can be used in any or all of these objectives, it may vary in the intensity with which it is sought in a particular project or at a particular stage of a project. Although observations by Williams (1983) showed that when a community takes responsibility for planning and constructing a system, it will also take charge of managing and maintaining it, the nature of the project and the characteristics of beneficiaries will determine, to a large extent, how actively and completely the latter can practice community participation. Where complex technologies and their adoptation dominate the design of a project, there may be less scope for the active participation of the beneficiaries in design, for example, than in a case where the technology is less complex and easier for common people to comprehend. At the design stage, therefore, a project may rely on information sharing and consultation, whereas during implementation, beneficiaries may be given a decision-making and managerial role.

It should be pointed out, however, that the degree of community participation in the programmes to a large extent determines the willingness of the people to manage the completed project. If the community only participates by providing information and volunteer labour without taking control and responsibility of the project, there is a danger that there will be a confusion as to who is responsible for the day-to-day management and maintenance work. If the project is community-managed, the question of maintenance will no longer be ambiguous because the community will have participated in all stages of the project which will help the people to work together and to develop their organizational ability which is vital for maintenance work.

Choice of technology

Closely linked to the ability of the community to manage and maintain its infrastructure facilities is the type of technology used to deliver them. The design and construction of the projects should not be separated from subsequent maintenance. This calls for an appropriate technology. According to Kerr (1989), "appropriate technology" is the term used to describe the appropriate application of scientific knowledge to development. Indeed, all technology should be appropriate. All engineering work should be designed and made so that it provides the best engineering solution for which it is intended while making the best use of resources available.

Traditional technologies are simple and labour intensive but low in productivity, whereas modern technologies are productive, but capital intensive and labour saving. They are also often large scale, centralized and heavily dependent on external resources and skills. In Botswana as in most developing countries, normally characterized with a shortage of capital and surplus labour, it is highly desirable to investigate closely the possibility of utilizing more labour-intensive methods. Case studies by among others, Lal (1973); McCleary (1975); Irwin (1975); Sen (1975); Edmonds and de Veen (1991), have been carried out in an effort to provide some factual data to justify the use of labour-intensive methods.

However, the choice of appropriate technology for various categories of work, can only be done after fully considering the factors which affect the choice, including design, technical feasibility and quality, costs, construction time, scale, location, resources and the human dimension. But if the local community is to take responsibility for the completed projects, then the choice of technology must take account of their skill levels.

Maintenance of infrastructure facilities

The importance of maintaining projects in developing countries is being stressed much more these days because many projects, especially in roads, failed in the past as a consequence of lack of procedures (Edmonds and de Veen, 1991).

In a traditional government water supply project in Botswana, a technician equipped with the necessary tools and adequate knowledge is stationed in a community to carry out the necessary maintenance and repair works. Very little effort is directed towards mobilizing the local community and teaching them the basic aspects of managing and maintaining the facility in their locality. This leads to unnecessary expenditure on maintenance labour which may even not cope

in case of simultaneous break-downs. In a community-managed water supply facility, it is necessary for the local community to select enough people to be responsible for overseeing the maintenance of the facility.

In road maintenance the situation is even worse. As governments have built up the road networks, the previous lack of attention to maintenance has become apparent in the declining state of the existing network. In many cases investments are having to be made into rehabilitating the existing system which had so painstakingly been developed. In some developing countries such as Botswana, the road network seems to be deteriorating at a faster rate than it has been constructed. Funds for maintenance are generally spent on improvement and emergency works rather than on routine maintenance. According to Edmonds and de Veen (1991), public works are caught in a vicious circle. Budgets for road maintenance are insufficient and are spent on putting the network into maintenance condition. There remains no funds, however, for routine periodic maintenance; thus the network continues to deteriorate. Because of inflation, the maintenance budget covers less and less, and more and more of it has to be spent on emergency repairs.

A first requirement, therefore, is a political commitment by governments to a rational maintenance strategy. Such a strategy should relate levels of available maintenance funds to a defined maintainable road network. Within a framework of such strategy, community-based maintenance employing labour-intensive techniques presents itself as a suitable approach. Again governments must endeavour to involve the community from the beginning. Also the necessary training and tools should be made available.

A case study

Infrastructure facilities in three major villages in Botswana

In order to improve the housing situation in Botswana, a pilot study was carried out in three major villages, namely Mahalapye, Maun and Tsabong, to assess the housing needs of the people in these villages and make the necessary improvements. During the study, it became evident that the conditions of the houses could not be improved without improving the infrastructure facilities at the same time. The main infrastructure facilities were identified as access roads, water supply and sanitation, electricity and telephone services. These were estimated to cost an equivalent of US$4 million.

The situation before the commencement of the pilot project

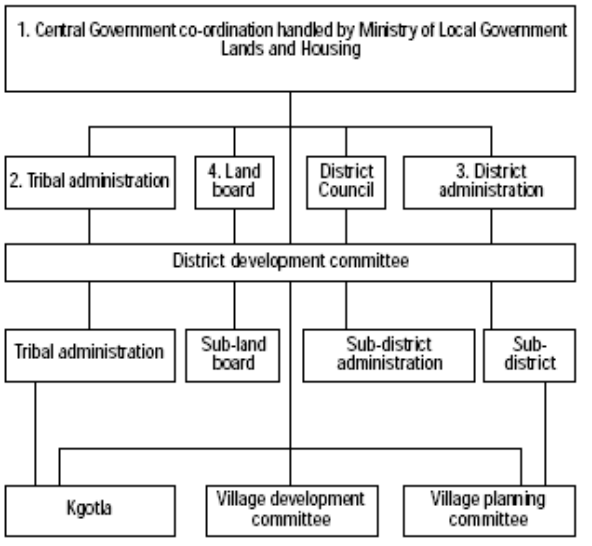
Institutional profile

The central government in Botswana co-ordinates operational implementation of the state via ministries and state departments. All government departments have presence in each of the three major villages, either directly or through representation by other bodies.

The Ministry of Local Government Lands and Housing (MLGLH) is responsible for the co-ordination between local government institutions, namely, the tribal administration, district administration, land boards, district and urban councils. Figure 1 shows the relationship between MLGLH, its district representatives and the local authorities.

The tribal administration falls under the Department of Tribal Administration within the MLGLH, and performs both traditional (tribal affairs) and developmental duties. District administration is headed by the district commissioner and its primary responsibility is to supervise the implementation of central government policy at a district level and to co-ordinate development planning and implementation carried out at the local and central government. The land board has the responsibility

Figure 1 Relationship between MLGLH and local authorities



Source: Mahalapye Development Plan (1995-2015)

of allocating tribal land in terms of customary and common law grant, imposing restrictions and undertaking general land management.

In general, the land board holds tribal land in trust for the tribe and the community. district development committees were formed to strengthen the co-ordination of the central and local government developments in terms of planning and project implementation. They are responsible for preparing and overseeing the implementation of district development plans.

Infrastructure facilities

The situation of these services in the villages prior to the commencement of the study was as follows: Access roads were not adequate as they did not reach all the places in the village. Moreover, they were narrow and sometimes located on unsuitable flood routes. Management and maintenance of these access roads which was supposed to be carried out by a local unit of the roads department in the Ministry of Works, Transport and Communications, hardly took place due to shortage of equipment and personnel and as a result most roads were inaccessible when it rained and very dusty in the dry season. Electricity supply in the villages, necessary for domestic use and street lighting experienced regular outages and this made the streets unsafe at night. There was also a backlog of plot service connections. Water supply in one village, i.e., Mahalapye, was supplied at standpipes without consultation with the community and as a result some people had to walk very long distances to these points. In the other two villages of Maun and Tsabong, there was no water supply system.

As for sanitation, every household was encouraged to have a pit latrine and assistance came from the district council for their construction. There was no proper means of rubbish disposal in the villages and hence rubbish scattered all about. It was only in some parts of the village that plastic bags were provided to households for putting rubbish in, and were later collected by district council vehicles.

Project preparation

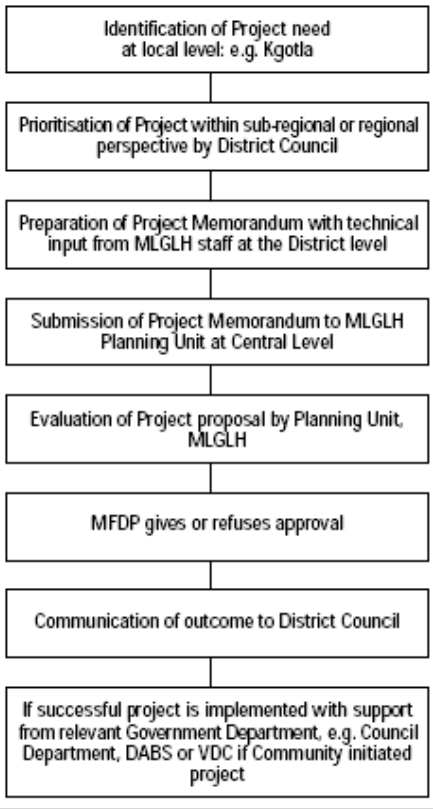
The economy of Botswana depends mostly on the mining sector which is controlled by the central government. The three villages under the study have very little scope to generate their own capital and therefore depend on the central government for funding. As such, ceiling budgets for councils, to a large extent are externally defined. Under these circumstances the central government needs to have evaluatory control over its disbursements to the councils in order to ensure that the project spending is prioritized within the context of a centrally-defined development trajectory. Key to this process is the evaluation of the project memorandum, prepared at district council level by the planning unit of the MLGLH (Figure 2).

It is apparent from the preceding section that, while the government encourages participation of local organs in the developments projects, it retains centralized control over all financial aspects. Consequently, the local organs basically become implementation agencies for government projects.

The situation after the commencement of the project

The government decided to change the earlier approach through the use of community participation as much as possible. However, the first two problems were to identify the stages of the project at which community participation was best suited and the capacity of the community to undertake specific tasks. Important also were the attitudes of the

Figure 2 Project memorandum process



members of the community towards participation in development projects and their previous experiences in such activities. This information was obtained by means of a survey conducted in one of the three villages, Mahalapye.

The survey

As part of a large survey to determine the preference of the members of the community regarding their future housing, semi-structured interviews on community participation were held with randomly selected members of the community. Cluster sampling technique was adopted where all households in randomly selected streets were interviewed door-to-door by the author and an assistant. This method was preferred to the use of a formal questionnaire because the author was aware that some members of the community cannot read or write and therefore they would need translation of the questions into the local language. An added advantage of the semi-structured interviews is that explanations to the questions were provided by the author where required. In total, 46 heads of households were interviewed. Each interview took about ten minutes and started by explaining the meaning of community participation and infrastructure facilities. The following are the questions asked and their responses (see Table I).

The responses to this question established that the majority of the respondents have participated in community activities of one form or another. Participation in such activities exposes one to the ethos of working together which is a very important aspect of community participation (see Table II).

The responses to this question established that a large percentage of the members of Mahalapye village still think that projects have to be initiated somewhere else, and that the most they can do is to contribute labour during implementation and maintenance periods, mainly for payment. This attitude has to be addressed if community participation has to take root in the village (see Table III).

Table I What type of community activities have you ever participated in?

Respondents (%)	Responses
45	Construction of a kgotla (chief's residence) and related structures
30	Repair and maintenance of boreholes for village water supply
20	Unblocking storm water channels by removing weeds and silt
5	None of the above

Table II In which ways can the community participate in infrastructure projects within the village?

Respondents (%)	Responses
5	Initiate and implement projects on a self-help basis
15	Initiate projects and ask for financial and technical assistance from the government or donor agencies
65	Contributing labour during implementation of government or donor-initiated projects
15	The community cannot participate in such projects

The responses to this question indicate that the respondents feel that they have greater influence in water supply and road projects than in power supply, telephone and sewage disposal. A possible explanation for this is that the technologies used to supply water and develop roads are familiar to the respondents, and therefore the feeling that they can exert some influence at the design stage. On the other hand, the technologies used to supply power and telephone are complex in the eyes of the respondents and therefore are difficult to comprehend and interact with. Apparently, the respondents were shy to even discuss sewage disposal. Their responses to this infrastructure facility indicate that they either have no idea of how to handle it or they look down on it. However, this question was aimed at foul water disposal and not solid waste which the respondents said should be dealt with through community participation (see Table IV).

The responses to this question indicate that the members of the community are aware of their weaknesses in technical and other skills necessary for infrastructure projects. The large percentage which suggested that training the members of the community in new skills shows that the members of the community are looking forward to capacity building that will enable them to run such projects once they are completed and also to replicate them where necessary (Table V).

The relatively high percentage of respondents who state that it is important that the members of the community participate in all stages of the project shows that they are aware of the fact that they can only operate a project effectively if they know its background thoroughly. This corroborates what

Table III In the infrastructure facilities planned for the village (i.e. roads, water supply, electric power supply, telephone and sewage disposal), what roles can the community play at the design stage?

Role	Roads (%)	Water supply (%)	Power (%)	Telephone (%)	Sewage disposal (%)
Determine the route	50	60	10	10	0
Determine size and capacity	30	20	0	10	0
Determine technology	20	20	0	0	0
No role for the community	0	0	90	80	100

Table IV In which ways can community participation in infrastructure development be strengthened?

Respondents (%)	Responses
10	Encourage members of the community to initiate projects through allocation of government assistance for sound projects
5	Sharing the costs of government-sponsored projects by unpaid labour or other forms of payment
65	Training the members of the community to acquire new skills to run the subsequent phases of the projects
20	Mobilize the community and ensure that conflicts do not arise during project implementation as they may delay the projects and raise costs

Table V At what stage of the project is the participation of members of the community most appropriate?

Respondents (%)	Responses
15	Planning and design stage
20	The project implementation stage
25	The operation and maintenance stage
40	All stages

was observed by Williams (1983), that when the community is involved in the full cycle of the project, a sense of pride and ownership in the project is normally generated within the local community. This encourages the members of the community to get even more involved.

The situation after the commencement of the project

Using the results of the survey was done by working very closely with the village development committees, the tribal administration and the district councils. Through this collaboration it was possible to sensitize people to come forward to express their needs through democratic negotiations in which individuals were given the right and capacity to negotiate.

A framework was set up where individuals participated in the design, construction and finally the maintenance of the services. At the design stage, the people in the communities were involved in all services.

In water supply, the people decided which routes should be followed, where standpipes were to be erected and how much water should flow from each. The work of the consulting engineer here was only to size the pipes and the necessary accessories which was then communicated to the people before drawings were produced. When the water supply drawings were ready, the people in the villages could easily understand them and this made them very proud of their contribution. Each village decided that four people were to be involved more closely with the consulting engineer and the technicians during the construction phase so as to eventually oversee the running of the facility. During the construction stage, the community supplied all the necessary unskilled labour required for clearing the bush, digging the trenches and laying of the new pipes. On completion of the water supply project in Mahalapye, the four people appointed to oversee the running of the facility started a training programme aimed at enabling everyone in the community to participate in maintenance works.

For the management of public standpipes, it was decided to select a caretaker (a resident within the standpipe supply area) for each standpipe who would regulate and monitor the use of the standpipe, organize regular cleaning of the standpipe site and intervene appropriately against misuse.

During the design of the access roads, the people decided where the roads should pass and reach. It was very interesting to see how the knowledge of the local people on the drainage pattern of the area could be used to avoid locating the roads on swampy areas. In some places, it became necessary to locate the roads in peoples' properties, but since the

people were involved from the beginning and that the routes were decided by them, there were neither objections nor compensation claims. The work of the road engineer was only to advise on implications of using alternative routes in order to connect places. With this done, the people in the villages volunteered to participate fully in the construction of the roads using labour-intensive methods and requested the engineer to arrange road maintenance seminars so that everyone could be made aware of what road maintenance is all about.

Management of refuse collection and disposal was entirely left to the members of the community. At community meetings, refuse collection sites were decided on by the members of the community in such a way that they involved as short walking distances as possible. The refuse, properly secured in paper bags, was deposited by the residents at the designated sites and was subsequently collected by hired hands from the community and delivered to the central refuse dumping site.

Telephone and electricity facilities in Botswana are planned, constructed and managed by a public institution. However, the communities managed to have their say heard in siting public telephone booths. In return for siting these booths where they wanted, the members of the communities agreed to guard them against vandalism.

Conclusion

The study showed that the way the government of Botswana does its work at present does not mobilize the full potential of the people who benefit from these programmes. The government does not immediately agree with communities where projects are taking place, hence there are no community ideals to strive for.

It further showed that people in local communities are reluctant to participate in the management and maintenance of projects which although benefiting them, did not involve them in the other stages of planning, design and construction.

The case study showed how, with proper planning, the people in the local communities can be mobilized, sensitized and made to participate in the management of infrastructure facilities on which they depend. Although the project in the case study is still ongoing, it has revealed how people show willingness to participate if they are given responsibility and control.

This seems to be the best option of ensuring sustainable development and management of infrastructure facilities at a community level.

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