Proceedings of the 16th WEDC Conference

Regional Centre for Urban and Environmental Studies (RCUES),
Osmania University, Hyderabad, India.

27 - 31 August, 1990

Infrastructure for low-income communities

Edited by Michael D. Smith

WEDC Water, Engineering and Development Centre

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WEDC *Water, Engineering and Development Centre*

The Water, Engineering and Development Centre (WEDC) is concerned with training, research, consultancy and other activities related to the planning, provision, operation and maintenance of water supplies, sanitation and other aspects of infrastructure in developing countries.

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Infrastructure for low-income communities

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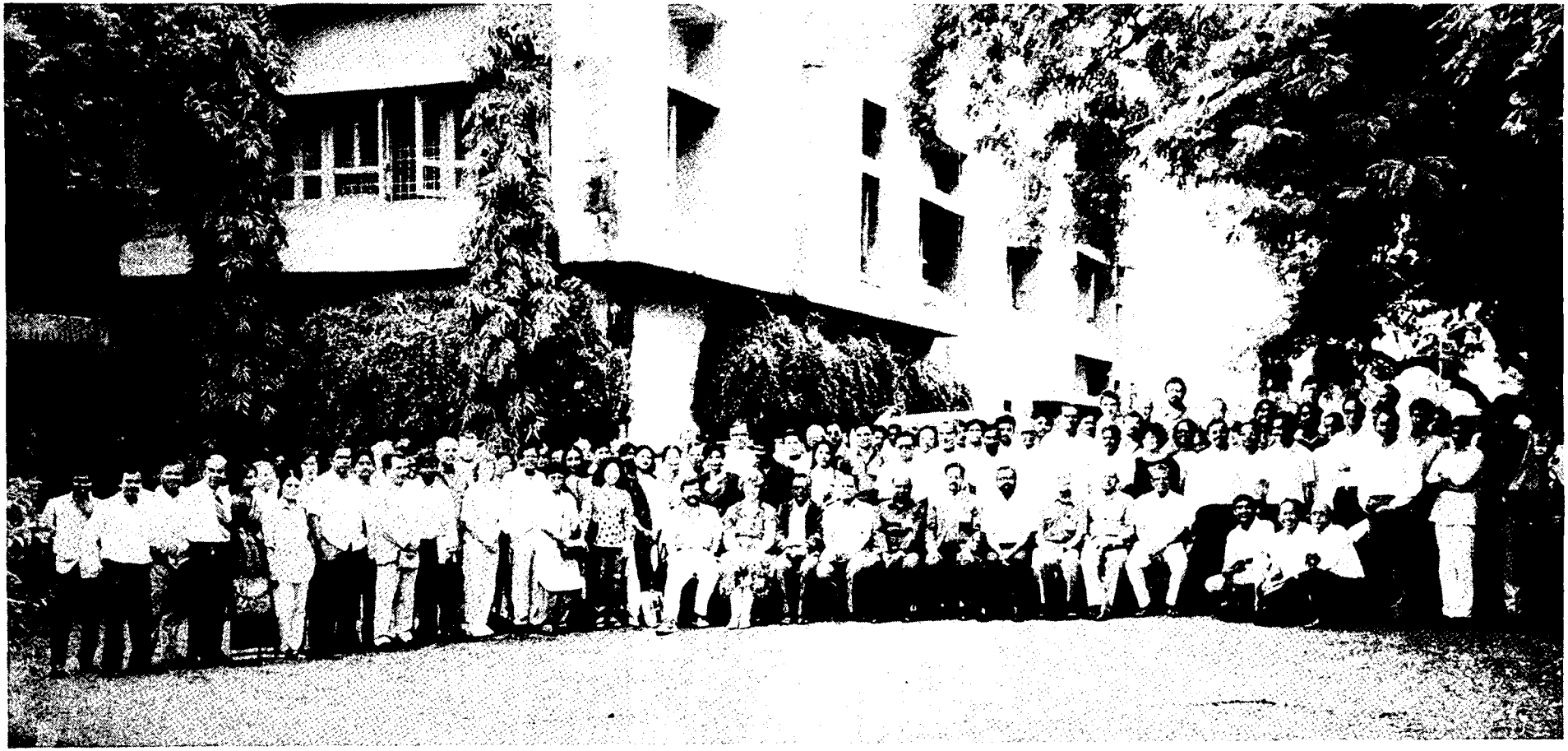

DELEGATES AT THE 16th WEDC CONFERENCE HELD AT RCUES, OSMANIA UNIVERSITY, HYDERABAD

16th WEDC Conference

Infrastructure for low-income communities

Hyderabad, India 1990

WELCOME ADDRESS

Prof. D. Ravindra Prasad

It gives me great pleasure to welcome you all to this International Conference on "Infrastructure for Low Income-Communities". One of the great challenges for 20th century mankind is the unprecedented increase in the world's population. World population which was 1.7 billion in 1900, rose to 4.8 billion by 1985. The projections indicate that by 2000 A.D., it will rise to 6.1 billion and by 2025 A.D. to 8.2 billions. A decade from now, eight out of ten people would be living in the developing world. Another feature is the urbanisation of the earth, particularly in the low income countries of Africa and Asia. World urban population is likely to be about 5000 billions by' 2025 constituting about 60 percent of the world population. About four-fifths of them would be living in developing countries. A majority of them live on less than $370 per capita per year. Women suffer several deprivations and inequities. Their literacy rates are low, wages are much lower, and access to social services and employment very difficult. One notices the blight of cities as well as the plight of people in the developing world. Between 40 and 50 percent inhabitants in cities live in slums and informal settlements. Shelter too is inadequate and in most cases, 3 to 4 persons live in each room. Households share the same room and multiple occupation is not uncommon. Nearer home in India, two-fifths of the urban population live in one room shelters with an average family size of five. They are devoid of basic amenities and their dwellings have no windows, are water logged and have inadequate sanitation facilities. While large cities are growing at a rate of 10 percent per annum, slums and squatter settlements are growing twice as quickly. Perhaps it is this that made the political philosopher, Alexis de Tocqueville to note that 'in the city, the humanity contains its most complete development and its most brutish. Here, civilisation works its wonders and the civilised man turned back almost into a savage'.

If we look at the infrastructure in 1983, only 59 percent of the world's urban population are served with sanitation, 71 percent have access to drinking water, but only 41 percent of rural population have access to drinking water and 12 percent have sanitation facilities in rural areas. There are wide disparities between region and region within the developing world. It is estimated that only 25 to 55 percent of the waste generated is collected by the local bodies. The developing world has serious problems of financing waste disposal projects.

In India, only 40 percent of the cities have protected water supply and sometimes are of inferior quality. Less than ten percent have underground sewerage systems. About half the inhabitants of the city have no access to even public lavatories and the standard of open spaces in our cities in distressing. It is not only absence of civic amenities but the unclean way of life in total disregard to civic obligations that makes the human settlements filthier.

It is said that Japanese slums are congested, their streets and lanes are crowded, but they are remarkably clean. But in India, and in other low income communities, the sanitary conditions are appalling. Earliest slums, the Jewish Ghettos were labelled as "Nauseous and deadly", Irish slums have earned the notoriety of being 'most fearful' and Charles Dickens called the British slums as "frowzy dens". But the slums in the developing countries, it appears, are worse than the. Jewish 'ghettos', no less 'fearful' than the Irish slums and much more 'frowzy' than the English slums. The relations between human settlements and environment cannot be overemphasized. It is becoming very complex both in the villages as well as in the towns. Pollution in the cities has spread the effect and has hazardous effects on the hinterland.

The situation in the developing countries thus presents a very gloomy picture and it is a cause for considerable concern. The deprivation of basic services in the absence of appropriate infrastructure has disturbing dimensions. These settlements and slums are the great unspoken, overlooked and underplayed problems of our times. It is these problems that made Prof. Muniford to describe cities as "Necropolises - the city of the dead - than Metropolises". With growing populations and urbanisation, the problems of poverty and hunger may become much more complex. There is need therefore, for each of the countries in the developed and developing world, making experiments to meet these challenges, to share their experiences. There is much to learn from the international experience. This is the rationale for this five day International Conference. This has brought the Water, Engineering and Development Centre, Loughborough University of Technology, U.K., (WEDC) and the Regional Centre for Urban and Environmental Studies, Osmania University, Hyderabad, India, (RCUES) together to organise this Conference. The WEDC has been organising such programmes during the past one-and-a-half decades. This the 16th such Conference. The RCUES, during the past few years, has realised the complexities of the urban problems, particularly of low income communities, and is actively associated with the training and research activities with the slum improvement programmes as well as provision of basic services to the low income communities.

The University's great strength is that it is an institution of independent thought. Academicians are those rare and privileged breed whose purpose is to think. Ideas are their tools. They are judged based on how boldly and creatively they expound their ideas and respond to the problems of society. The nature of such response determines not merely the regard in which academicians are held, but the capacity of the country to deal with most complex problems intelligently. Universities have a crucial role to play as agents of change and of social criticism. We in this University are equally conscious of the need to shed elitist orientations

and possess the sensitivity to comprehend and even to anticipate changing social reality. It is this realisation that has brought us from the University to the city where low income communities live under appalling conditions. Some of you are aware, it is this commitment of ours that made us to actively associate with the poverty alleviation schemes like UBS, Slum Improvement Projects, etc. in the region.

This collaborative endeavour has brought about 150 experts from 18 different countries and international agencies coming from universities and institutions, government and non-governmental organisations, policy-makers and practitioners, as well as ladies and gentlemen. During the five days, we expect to share our experiences, exchange innovative ideas, look at the experience of Hyderabad and its environs and try to learn from each others' successes, pitfalls and problems. I have no hesitation to say that this group of distinguished men and women of thought and action would benefit from the deliberations that would pave the way for effective action to deal with the problems of infrastructure in the low income communities.

Friends, we have in our midst, this morning, distinguished men from administration and academia. Shri T.L. Sankar who is to deliver the Inaugural Address, is a senior administrator with long years of experience. He held very senior administrative positions in the State and the Centre. During the last decade, he has been the Director of the Institute of Public Enterprises, an academic institute of repute. He is currently, Director-General of the National Institute of Rural Development, a premier institution in the country involved in research, training and consultancy in rural development. His specialisation is energy. He published several books and articles. Thus, he combines in himself both administrative and academic interests. Sir, we are looking forward for your valuable address.

Shri B.V. Rama Rao, a distinguished member of the Indian Administrative Service, has occupied several important positions both at State and national levels. During the few months, he has been in office as Principal Secretary, he has been taking keen interest in implementing the programmes aimed at providing housing and infrastructure for the low income communities in urban as well as rural settlements. As Chairman of the Advisory Committee of the Regional Centre, he has been a source of strength to us and his guidance in organising this Conference has been very substantial.

Shri P.S.A. Sundaram is an Urbanologist of repute having spent most part of his administrative career in dealing with the problems of housing and urban development at state/ national levels as well as in international organisations. He has written extensively on various aspects of housing and urban development. He is, right now, busy with authoring the housing policy for the country. He has been a guiding pillar to the Regional Centre during the last decade and more. I am thankful to you Sir, for agreeing to deliver the Keynote Address.

I do not think it is necessary for me to introduce Prof. John Pickford. Firstly, he is the Co-Convener of this Conference and secondly, most of you have been attending the conferences organised by him during the last decade-and-a-half. This 65-year old young man of WEDC is wedded to the problems of the poor and this is evident from the list of subjects of the international conferences which he has been organising.

One important functionary who is the moving spirit behind this International Conference, but who could not participate, is our Vice-Chancellor, Prof. T. Navaneeth Rao. He is a distinguished professor of Chemistry, an educational administrator of repute, an ardent environmentalist, and above all, is one who seeks excellence in the university system. He rang me this morning and conveyed his wishes for the success of the Conference. I regret, we could not have the benefit of his ideas; though we have his wishes.
The subject of the Conference is 'Infrastructure for Low-Income Communities', the Conference is being organised in a developing country, it is being hosted by a university whose financial position, as in many of the third world countries, is not too very bright. Organising the conference in such a context has its own problems. Furthermore, it is a collaborative programme. As one scholar has noted, collaboration means two people thinking differently and doing things the way they want to do independently. Notwithstanding these limitations, we have made every effort within the constraints operating on our low-income budget to make the Conference successful. Despite this, if you encounter any difficulty, I request your indulgence to bear with us and ignore the difficulties and contribute to the successful deliberations. I have confidence we could have sufficient food for thought which will lead to effective action to improve the infrastructure in the low income communities contributing to improved standards of living.

I once again welcome you all to this Conference being hosted by the Regional Centre for Urban and Environmental Studies, Osmania University.

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INAUGURAL ADDRESS

Shri T. L. Sankar

Mr. Rama Rao, Dr. John Pickford, Mr. Sundaram, Prof. Lakshmipathy, Prof. Ravindra Prasad and my dear friends, I consider it a great privilege to have been invited to inaugurate this important International Conference on "Infrastructure for Low-Income Communities".

In spite of the build-up given by Dr. Prasad, and later by my good friend Mr. Rama Rao, you would have noticed that my own credentials to talk about the urban infrastructure or any issues of urban interest is somewhat limited. Not that I have credentials in any other subjects. The only thing that prompted me to accept this very kind invitation was my concern for the low-income groups, whether they are urban or rural, you would agree the problems of poverty are about the same in both sectors. The way to tackle them may be somewhat different depending upon whether you are in the urban location or in a rural location, but the essence of the problem is that these poor people do not have enough to eat, they do not have the facilities or access to education or health or even the minimum service levels of sanitation and water. The deprivation certainly is something which is common to urban as well as rural areas. Underlining all this is that rural peoples' inability to organise themselves to take care of their needs. Therefore, I was very happy to accept it and I was delighted to notice that you have given equal importance to rural as well as urban infrastructure in the programme. I certainly appreciate the concern you have shown for some of the key issues such as water and sanitation selected for a special discussion on the ways they need to be delivered, organised and made available through community action, through women and through non-governmental organisations. Therefore, Sir, I commend the organisers for the great care that they have taken in organising it. I, as one who is currently involved in rural development activities, thank them for having taken care of rural areas.

Rural and urban divide is something which people only talk about. It has assumed a great deal of importance in our country because of the great potential this idea has for political advantages. Questions have been raised about the direction of development of this country, which is criticised as having been urbanised to the neglect of rural areas. But, if you look at the problem, the problem of poverty is the same in rural and urban areas. I think the failure of our development is not that it has accrued much to the urban, to the neglect of rural, but it has accrued to those who already have, to the neglect of those who do not have; whether they live in urban or rural areas. It is one of those things that strikes us so shocking, somewhat annoying, sometimes, a matter about which I feel extremely ashamed. When we go into the poor areas, whether it is urban or rural sectors, the extent of lack of attention to basic cleanliness, sanitation is the same. It is something which should concern those who have forgotten that sanitation could be the base on which they can build-up a life free from disease, a life which can be healthier, and where children can play without the fear of contracting diseases. We find in both rural and urban areas a shocking level of disinterest within the community to do something on their own to improve the situation. This may be partly the result of interventions by the government. Interventions by the government, about which I am sure you are going to discuss a lot, have created a certain amount of parasitic dependency in the last thirty years in our own country. The dependence on the government for even the basic things, which communities can do for themselves, has led to a great fall in the vitality of the community itself to improve matters; whether it is in the rural or urban areas, whether sanitation or water supply. This is of great concern to many of us because the large amounts of money that the government is presently spending on curative health is something which could have been avoided if only we had spent enough on what we call preventive or public health issues. But the government has taken upon itself in delivering these services through their own agencies without adequate extension or educational efforts. That is why, I am happy at the idea that water supply and sanitation and the role of women and non-governmental organisations are slated for discussion during the Conference.

I am sure, that one of the areas where immediate efforts could be made is improving the bank of technological alternatives for making the sanitation investments cost-effective and also effective in terms of use of scarce resources, such as water.

Recently I came to know that Dr. Aktar Hamid Khan, who was a member of the Indian Civil Service (ISC) (to which we, IAS, are the heirs), is a very old man, now nearing 80 is working as Volunteer in Sanitation Improvement in Karachi. Dr. Aktar Hamid Khan, though being an IC Officer resigned from the service to gain the insight into poverty. He worked as a manual worker in Allahabad for few years and then went back as the Principal of the Komila College, Bangladesh. There he established the Bangladesh Academy of Rural Development. Later, after working with various other institutions, he has settled in Karachi. He is currently working in the slums of Karachi where mostly the Biharis live. He is organising them to design through their own efforts and also to construct their own individual sanitary facilities, what you call toilets. Here was the person who induced a number of self-help experiments and community action, and has finally selected the particular approach and the issue of household toilets because of his deep conviction that it does give the family a certain amount of self-respect which they could not have attained in any other manner in any field or institution.

We, in the government circles, feel that a toilet is a cost-intensive facility; when government provides the poor a

house, a toilet is not included. The 'provisioning' by government includes externally conceived design, technology, finance and even the site; all of these with least involvement on the part of the beneficiary. This is happening in every state in India. Now, a person like Aktar Hamid Khan, who understands the requirements of poor people, has realised that the provisioning would be meaningful and self-sustaining only by doing something through the community itself; all that is required is to create the awareness, create the confidence in them, impart necessary skills, but much more than that, organise them for community action.

The pattern of assistance for infrastructure is the same both in rural as well as urban areas. We see everywhere as you go along any rural road or the city; mute witnesses to user indifference, and negligence. There are pits, naturally there are pitfalls. Conspicuous by absence, is the total lack of community interest in organising for making better the roads. Even by a casual look at the major highways or the city thoroughfares connecting Secunderabad and Hyderabad brings us the shocking revelation. But, if you get into colonies, developed by various groups of people, you usually find a big sign board publicising the existence of a Cooperative Society, all the property owners having come together as a cooperative only to take land at concessional rates from government. After having acquired the land constructing the house, the 'cooperative' part of the community disintegrates. They would only be content from then on with criticising the executive body of the society. The society simply passes the buck to either the government or municipality for not taking action. It never occurs to the people in the community that if they all come together to do something on their own with even hired labour, the roads could be improved a great deal.

But a more important action by the community should be to ensure that these requirements, whether of rural of urban infrastructure, are provided in a manner that the rural or the urban poor get involved, and employment opportunities are enhanced.

The most logical key to the well-being or to removal of the problems of low-income communities is to shift them to a higher income group; and income can only be created by employment opportunities. The employment opportunities obtained in the urban informal sector is of such a kind that it is not something which adds to the self-respect or something which enables or makes them better human beings. You have only to go across the street corners, it is the same all over the third world countries, to see building youth who can if provided an opportunity, do a lot of productive work instead of wasting their time in doing things which cannot even be mentioned in this assembly.

Therefore, the whole question of providing infrastructure would have to be discussed in terms of the requirements of the poor people and those likely to be met by providing necessary skills as well as confidence in self-reliance on the part of the local community. In the few experiments, in terms of interventions by the non-government agencies which I have seen in the last three months, I am quite convinced that the efforts to alleviate poverty any income generating activities, succeed only if the people are involved in the process. Unfortunately, in our country, we have a tendency to involve people in a very symbolic manner only.

The right to work will be a reality only if we use the right of enjoying democratic decentralisation efforts. Democratic decentralisation is expected to result in the exercise of power at grass-root level. If the authority being vested in Mr. Sundaram and Mr. Rama Rao, (Government Officers) is to be simply passed on to the functionaries at the 'samithi' or the block, or group of villages, it will not be democratic decentralisation. This will not bring about community participation at all. There is a lot of conflicting views on this. Democratic decentralisation without the requisite participation with confidence on the part of the poor is not going to help. It may help in the planning of certain larger issues, but in terms of alleviating poverty, it would be of very little use because powers are being exercised and decisions taken by experienced government officials with a great deal of training and requisite background. Their professional commitment will be replaced by others. Apart from the lack of training and professional commitment new leaders will have the problem of having to reckon with the local politics with which our senior people in the government do not get entangled. Therefore, the demonstration of anxiety to give away powers to the local people is not the same as organising community participation. Efforts at organising communities, in terms of getting them all to do some work on a village road on just one evening is totally different for real community organisation to undertake planning, design the action plans, implementing, monitoring, evaluating and initiating correctives wherever and whenever necessary. Initiating efforts to institutionalise continuous action taken by the community is the only way for sustenance of the efforts for the development to the poor. Though complex and time consuming is the only desirable direction in which we can go.

A major problem we find in a number of non-government agencies is that they achieve intended goals only as long as there is a particular person or a given environment, as long as there is support from some other agency, inside or outside the country. These agencies become totally dormant immediately after a change in any of the favourable parameters. There is very little appreciation of the fact that interventions to support can only be to create awareness, skill, confidence and self-reliance. These interventions, whether they are by government or any other agency, should not strengthen the sense of dependency. If the other activities, whether by the communities, women and non-government organisations, are also going to promote dependency, then I would have no hesitation to say that they also should be avoided.

Recently, I went to a village to participate what we call a social laboratory in the National Institute of Rural Development (NIRD). I went to this laboratory intended to provide the targeted people, an action plan for a community well for irrigation. We had tried to document the problems likely to arise during the pre as well as post project phases. After having constructed the well and installing the pump, I was surprised to find a small group of eight people coming forward to tell me that I should appoint somebody on a salary of Rs.300/- pm. to look after the maintenance of the well and the pump-set mainly because the community may not be able to discharge the common responsibility even though the community may suffer if something goes wrong with the pump-set. I had to tell them that the intervention

was not aimed at creating an asset for the NIRD and that the asset entirely belongs to the community. The NIRD cannot have further interventions. Having set-up the facility, the NIRD experiment comes to an end and the community should maintain it.

The extent to which self-reliance has to be created should be the measure of success to external agencies. I found through the experiment that wherever it was tried to develop the feeling of self-reliance, we could succeed though slowly.

I would like to close with another vignette on the efforts in Bangladesh which the participants from that country might well be aware of. There is a bank which has about 7.05 lakhs clients, every one of them is an assetless, land-less poor. Ninety percent of the clients are women and yet the recovery rate is 98.5 percent. The weekly turnover is of the order of Rs.50 crores. These are the type of efforts that could be emulated everywhere. The most important of all the things which I saw for myself was that the entire structure was built-up of little groups of women, each with a tremendous level of self-respect and pride in what they themselves were creating, a feeling of esprit de corps as good as in any army. I even saw them even saluting each other in the army style whenever they meet.

I would again submit that my own competence to talk to a group of people like you who have been working in this is very limited. My own interaction with the efforts people make in developing the poor, whether in rural or urban areas, is also very limited. But my own intellectual background which has led me to put self-reliance, self-respect as the most important element in a human being's life is a long one. Even as a student, I was interested in this aspect.

Today, I find there is a great deal of truth and a great deal of importance that one should attach to the concept that communities and the people therein will have to be helped to do those things for themselves. They should never be expected to surrender the spirit of self-help for the sake of expediency or for the sake of any dole, however generous it may be. If that spirit forms the basis on which self-reliant groups are formed, groups can coalesce into communities and these communities can plan for their own infrastructure development. There will then be sustained development, which will provide the people with a sense of fulfilment of not only the physical needs but also the higher needs which make them better humans in a better society.

Thank you very much.

16th WEDC Conference

Infrastructure for low-income communities

Hyderabad, India 1990

KEYNOTE ADDRESS

P. S. A. Sundaram

Mr. President, Mr. Sankar, Prof. Pickford, Prof. Prasad and his colleagues, distinguished delegates from India and abroad,

I am extremely grateful to have been given the privilege of speaking to a distinguished gathering, each with immense experience on the ground in dealing with various problems of infrastructure in both urban and rural areas. Similar to what Mr. Sankar had felt, I also cannot claim the experience of having actually worked with communities except, of course, that I have interacted with communities in a variety of situations (both urban and rural) and I have also been involved in a number of projects intended to improve the quality of life of certain sections of urban populace.

The Seminar theme is infrastructure for low-income communities. Now, a couple of questions automatically cross my mind. What is infrastructure? Who are low-income communities and where do they live?

Now, infrastructure can be covered in a very wide context of sustaining economic and social development. An economist may show preference for power, communications and transport, and along with those specifics which provide the spur to the economy on their own. Those who primarily operate at city level tend to support industries along with logistic elements such as transport and communications, likely to have a direct bearing on economic and commercial activities. Yet a third stream may comprise of people at the basic level of eking daily livelihood, under extremely deprived conditions in terms of water supply, sanitation, education, health and other basic services; especially those as deprived as Prof. Prasad has already mentioned. Such a group would like to pose the priorities in quantifiable terms of access to potable water supply and sanitation. Thus, the preferences would vary depending upon situations in which a given low-income neighbourhood is placed. In fact, it would also depend upon what is upper most in the minds of people vis-a-vis the variety and range of deprivations.

You are all aware that it is extremely difficult to discuss the needs in general of low-income neighbourhoods especially if the goal is to identify planning preferences on priority scale. I have seen some people opting for an access road with utmost urgency, while some others in the same neighbourhood would prefer a retaining wall. Communities situated on dangerous slopes, strongly desire something that is likely to give them greater security of shelter. The range of priorities may vary from quicker transport to the work-place to much more complex and important elements such as infrastructure which enables them to pursue their occupation from within the residential premises itself, or improvements to the work-place rather than water supply or sanitation even. So, in fact, what constitutes infrastructure boils down to investment patterns and priorities with emphasis on immediate action, subject to change from one neighbourhood to another neighbourhood. But, I suppose over a period of time, we strike a common denominator, settle on certain set of basic services embracing water supply, sanitation, roads and other elements as required.

In India, under the Slum Improvement Scheme, we have a broad band of seven basic amenities which, by and large, is the same all over the third world countries.

Now, my second question about who are low-income groups or where do these communities live? Now I, for one, would not agree with the proposition that poor live only in slums. The tendency to identify slums with the poor is rather unfortunate. It is as much true that slums contain people other than poor, as it is to say that poor live in areas other than slums. Now the slum is a convenient description often, used by town planners; who conceptualise, orderly development as a matter of spatial distribution who categorise poor as those who live in what might be called spontaneous informal settlements that do not conform to their notion of orderly development, or areas not earmarked for formal housing. These planners then proceed to designate them as slums, borrowed from the old western terminology, the crowded neighbourhoods, The term "slum", primarily denotes deprivation of services rather than of what you call disorderly development as such. So, when we talk about low-income communities, I think we must be prepared to deal with the problems of infrastructure in whatever form or wherever they are. The basic objective of any enquiry on the requirements of infrastructure for low-income communities should be to render assistance in their struggle to move along in their existence, whether urban or rural milieu. If you start looking at it from this point of view, then infrastructure can also be profiled in terms of inner city renewal, in terms of augmentation of services to old and blighted housing colonies or improved services for people living in low-income neighbourhoods and the type of cooperatives which Mr. Sankar has mentioned. We will have to appreciate the term, 'infrastructure for the poor' in the light of whichever situation they are, in terms of whatever it take to improve their incomes. I think it is important to try and develop this kind of holistic perspective on deprivation and poverty. While looking at the infrastructure for the low-income communities, we have got to try and relate to what happens in a given neighbourhood, at the zonal and the city levels. It is also possible for a slum dweller in a typical slum located in the midst of good development to rate the installation of a water standpost, or latrine with utmost priority. But, in the context of developing a whole cluster of low-income neighbourhoods or in the context of integrated development of a city, it becomes important that we look at how the services are being augmented and distributed in the city as

a whole. We have got to try and look at the way in which the services reach different sections of a community. And we have got to try and look at also the way in which the services are maintained in different parts of the city.

As we continue to look at the services, another important feature that would strike us is in the level of services. We talk about the per capita water supply of 40 litres or 100 litres or access to sewerage at 8%, or latrines at 30%. Such a global data while clarifying the adequacy/deficiency in totality, successfully camouflages a wide band of latent disparities. In fact, data like per capita supply of 100 litres could conceal about five ranges which have been actually found in a survey of 50 towns in India. It could conceal ranges from 500 to 40 litres, it could even conceal a situation where people get virtually no water. It could conceal disturbing facts like people having to walk miles and miles in gaining access to water. This is the problem all the time. So what we have to look at is the way in which the services are distributed in terms of deficiency analysis, and try for improving the distribution of existing services. Thus, the need for deficiency analysis, becomes an important reason to replace an average view of the city services. A second reason for generating city's service profile data is that it helps in breaking out of the usual contingency response, i.e. simply patch, repairing the existing situation, whether it is a problem of water supply or sanitation or an access to service for a particular group of persons. The service profile also clarifies the context for expanding the service to additional areas for the purpose of developing shelter for the poor. That is, the entire service delivery system gets integrated with the provision of shelter programme. People seek shelter in various ways either in terms of spontaneous settlement or by seeking new areas in the peripheral regions of development; what we call unauthorised colonies. People also ask to augment, though in an unplanned manner, existing services in crowded neighbourhood. Thus, we have to look at the service delivery scenario as an integral element of shelter activity. The element of shelter extension should be as important as the construction or upgrading process itself and needs to be provided in fact, as a part of shelter package. And, again, looking at it from the point of view of city government, it makes eminent sense for a city government to try and use land as an important resource and build into the land price the cost of providing infrastructure so that resource mobilisation for the low-income communities does not remain an insuperable task for the city government. They would be in a position to levy differential charges on the more affluent sections of the communities, or the commercial users, legitimately for the services. The other reason why we have to look at the infrastructure in the service cover context is the whole issue of paying for operation and maintenance.

Now, city after city, one often hears that the municipalities are generally broke financially and they are not in a position to pay even the salaries. I will not quote instances, but there are cases where their revenues are not even sufficient to pay for the establishment, where the bulk of the expenditure on services, in fact, is taken up by establishment, where the revenue gap could be as much as 50% of the total ordinary income of the municipalities, where they are not in a position to maintain even half of the city in terms of roads and solid waste management and so on, where 50% of the garbage is not even collected and where the entire water supply installations are in decimated condition. Now, all this is apparently happening because the municipalities are not able to realise as much income as they should, nor are they in a position to improve yields from existing properties. Now, the answer to the precarious situation partly lies, again going back, in the concept of equity where everyone is taxed according to what one can pay. Instead of advocating a levy of a blanket rate of a community charge, I wish to emphasise the notion of differential charge wherein one pays in terms of costs he imposes on the community. Thus, a levy of differential system of charges would help in effective utilisation of whatever taxable assets the municipality may have, subject to the fact of stricter enforcement of collections. It has become a very favourite paradigm for International Aid Agencies to say that when you take-up slum upgrading projects, it should be based upon full cost recovery whereas, we have not even attempted enforcing of full cost recovery from the neighbourhoods which are formally sanctioned. Property tax is a case, for example, which in fact remained stagnant at one-tenth, one-hundredth of the market value.

Does it augur well for the financial health of a local body, when we do not even try to rationalise this important source of revenue? Whether the slum dwellers are to enjoy the services free of cost is totally a different question. Both the issues revolve around the concept of effective recovery from existing properties and existing users so that operational maintenance is effectively done. These then are some of the city level questions which deserve pre-eminent attention in any informed debate on investment on infrastructure.

The next issue that automatically comes to fore is integrating provision of services. The term again, by the what you might call accident, delves into the terminology of conventional wisdom on water supply, sanitation and urban services. The UNICEF started it by coining the phraseology 'Urban Basic Services', 'Convergent Delivery System' with community participation and we hear of horizontal, vertical integration, etc.,. But what is really meant by integration is that there should be a single local point for action, i.e., the users being in a position to be able to deal with one single point effectively in terms of getting access to desired services. It also meant that various agencies, instead of working at divergent purposes, being organised to achieve some level of synchronisation and convergence at least in service delivery. It also means that the different departments of a municipality itself, being able to use a common terminology, which is what I think the ODA projects are seeking to achieve, i.e., synchronising the activities of different agencies, using a common terminology for analysis of the issues pertaining to the low-income communities and ensuring optimum results in whatever they are seeking to do. For instance; employment promotion, augmentation of nutritional support, broadening the base of social services and prioritising the investment channels amongst various communities or neighbourhoods.

Now, that is something whatever you can call it; in Indonesia they would say; Kampung programme, in Colombo they would call it the garden, and the council arrangements to describe the various arrangements by which this kind of coordination is sought to be achieved. In Lusaka, they have the system of the project unit, whereby the shelter provision is effectively rendered. So, we have different arrangements in different places but, essentially working out unified systems of coordination at different levels, hierarchically or laterally.

Essentially this is what a city government is all about, but paradoxically in government, the left hand may often not know what the right hand does. But what really perhaps, is missing which I think the developing countries are increasingly realising is, the need for one more level of integration, that is to build every action programme around the strategy for poverty alleviation and employment generation and secondly, to graft the logic to urban management practices at the city level. This is something that in India, in recent years, we have started doing. The whole question of trying to place basic services within the context of an overall poverty alleviation strategy arises because poverty alleviation is not just a hand-out or a series of handouts or doles. It is not just dealing or helping some people to promote informal or other types of enterprises. It is not simply a wage employment effort. It is also not simply launching a series of parallel nutrition programmes or maternal child welfare programmes or public distribution systems. It is something that localises all these in compatible terms with the poor and their local priorities. We try and provide a menu within a system wherein poor are in a position to selectively take advantage of what is available in the menus. It could and ought to, I think, conceivably consist of measures to promote employment and augment incomes, or wage employment, or promotion of micro enterprises, or helping women to augment their incomes including provision of wages in which a woman can augment her income sitting at home It should encourage social inputs which will help them in achieving these along with open access to health facilities.

The menu will also list a whole range of delivery issues on public distribution system and a variety of other information which effectively protect the real income of the poor, something that is directly related to the actual conditions in which the targeted poor are living. What Mr. Mahboob Nurul Haq mentioned on poverty contains the whole scenario on direct alleviation of the conditions in which the poor are living. Here, we get into the areas of basic services, the improvement of the ways in which people get access to services, and all this has to be built around systems of decentralised management of urban services, about strengthening the local bodies (urban or rural), about the linkages with neighbourhood association, about ways in which one could relate with the specific problems of the poor. In this, it is important to realise that we mostly do not encourage people to participate in what we do. This, I often think, is a glaring mistake common in all government agencies. Trying first to select the programme, decide upon a given programme, and tell the people "look here it is, now come and participate". No, I think, it is more important to try and see how we can participate in what the people are doing; what the people themselves are trying to initiate. I think that change of orientation is important if urban agencies themselves are to be strengthened. Here is where I think all the government, the training institutions, the academics and the whole lot of other voluntary organisations concerned with improving the functioning of the local bodies should aim at.

Now, a couple of things about environmental aspects. It is not just that the environmentalists talk only about green spaces. Yes, they talk about the greenery but there are also other important environmental aspects which are related to the entire question of infrastructure. This can be looked at the home level, at the work-place level, at the neighbourhood level or at the city level and even at the regional level. If you look at it in terms of home level, it is apparent when there is lack of access to potable water or to sanitation or to systems of garbage disposal. These deficiencies constitute the view. If you look at it in terms of the conditions in which the poor people live, the shelter aspect, the crowded conditions in which people are living, supplement the view. Now, here is the seminal difference between the urban and rural areas and infrastructure. This Conference is as much concerned about urban as rural, yet, in urban areas typically, the infrastructure deficiencies are far more conducive to diseases and the bad environmental conditions which severely effect h health and productivity of the poor workforce therein which perhaps, would be the case with rural settlements also, but with a different threshold levels of influence. The over-crowded conditions leading to high levels of susceptibility to all kinds of accidents, the dangers of over-population and the resultant congestion, the existing inadequacies in infrastructure, the tentativeness of settlements, the sense of insecurity and impermanency of the settlements and the threat of eviction comprise the array of problems constant with the community. Location in low-lying areas or on hill slopes combine to pose new technological challenges in the building of the infrastructure itself. These, then are the key questions on developing infrastructure, which beg feasible solutions from the technological, sociological and managerial fields. The ever persistent feeling of being pushed about or thrown away, I think, will always weigh heavily on the minds of the people even when you talk about a simple thing like cost recovery.

The rural areas, by and large, have different sets of problems. For instance, occupancy right is something that has been and can be guaranteed whether you call it a tribal right or a common's right. In India, we call the homestead rights. Whichever way you seek to convince, the user reservations become apparently inviolable. Occupancy, by and large, is not a problem. The real problem is providing them with services as part of the infrastructure for rural development; water supply, access roads, and the way in which the sanitation can be improved. Drainage becomes as important as sanitation; and the way in which the linkages can be built-up between the rural and urban areas in terms of roads, in terms of market places, in terms of yards and so on.

I think it is important to recognise environmental degradation which a city itself is responsible for; considerable amounts of natural resource pollution, in the shape of highly toxic effluents which they discharge into water courses; in terms of the ways in which the garbage is disposed; in terms of the common breakdowns in social structures. Degradation is detrimental to all healthy living. At the rational level, of course, the cities and villages combine to form a unique mosaic of new environmental problems mainly leading to infrastructural deficiencies or poor maintenance which, in turn, have a debilitating impact on the low-income communities and low-income settlements without any clue to individual aspirations. So when we talk about infrastructure, I think, we will have to look at it in terms of an individual's perception of deprivation of basic necessities. We will have to look at it in terms of how and what is happening in a given neighbourhood, how the various types of pollution affect health and other things, and the way in which the industries (if not controlled, regulated or charged for the cost imposed

on economy) affect the community. The Bhopal tragedy in India is a classic example of how industry when not controlled, impacts upon a range of innocent population of an entire city.

Another glaring instance is the way in which developed countries dump toxic wastes on the developing countries. Instances can be multiplied on what is happening at the global or even at the city level.

Let's not merely try to limit ourselves to simple questions of slum improvement. Let's try to look at the broader issues of environment and broader issues or urban management and how infrastructure deficiency affects not just the health, not just the environment but, the way in which a person seeks to raise himself in terms of income augmentation, in terms of employment opportunities. I think that is very important.

And lastly, the delicate, yet, complex question of cost-recovery. Now it is in fact impossible for a city level infrastructure system or neighbourhood level infrastructure system to be laid in a way that is self-supporting. Is it axiomatic that you provide every service and the municipality struggles with maintenance and gives it up as a bad task, so that slums improved five years ago require to be improved all over again. Is it axiomatic? Is it absolutely inevitable? Is it not possible to design the laying of infrastructure in a way that involves the community, in a way that makes the community feel responsibility for the maintenance of the services, in a way that the maintenance of services is neighbourhood-based rather than a central system-based. Now, there are instances; Orangi, the classic example of how a low cost sanitation system was designed and built to suit the people's requirements and is in fact, maintained by them. In Bombay, we try to upgrade the slums by grouping huts into cooperatives and designing the services in a way that suits their preferences so that, over a period, the entire services come to be maintained by them. In Delhi, we are trying to work on systems by which a full in-situ renovation can be taken up if required. Those 'share toilets' that are being maintained by the people, and the water outlets being provided are clustered around an open space, and in-situ renovation takes place as part of broadening the existing infrastructure.

Now, in the design of service delivery we try and take care to involve the users in the maintenance responsibility. The city management can concentrate on the essentials of facilitating the design, facilitating laying of the infrastructure, facilitating the linking of it to the main infrastructure and ensuring that the costs are distributed without imposing a charge on the community. Such a system is already in vogue in Columbia, whereby people are charged for incremental services as additional areas are progressively taken up for development.

And, lastly, the issue pertaining to reversing the trend of inefficiently used lands in order to generate resources which can be used to pay for infrastructural development. It is possible that cost-recovery is not altogether something that is an indomitable, insurmountable and hopeless task. It is a question of trying to look at the way in which the services are going to be created and maintained over a given period, vis-a-vis the willingness of the potential beneficiaries. In a sense, looking at from the point of life-cycle concept, the entire life-cycle of the infrastructure, what Prof. Pickford has already mentioned: the combination of technology, sociology, management and community participation and relating to the requirements of the beneficiaries. Here, the most pertinent question which arises is how the women perceive the services? In Delhi, we found that, as a group, they preferred shared toilets. In Bombay also, we found the pavement dwellers preferred not only shared toilets, but also wanted some special arrangements for children to squat. Such features.are often, missed by us.

So, there are whole lot of small things that come up when we consult people and try to get involved in whatever they are trying to do. So, this, I think, is a very important message for us and I think we ought to approach the entire question of infrastructure provision for low-income communities in a humble way. We have absolutely no right to feel superior. We have no technological or administrative expertise or knowledge of the sort which confers a hallow on us to preach to people how it is to be done or what is to be done. I do not think we have that right at all. I think, we have to feel humble, we must try and see how the people in fact, are seeking to solve their problems, and try and relate our systems as much as possible to what they do in reaching a solution.

16th WEDC Conference

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VOTE OF THANKS

Dr. V. Lakshmipathy

Shri T.L. Sankar, Chief Guest of the Day, Shri B.V. Rama Rao Shri P.S.A. Sundaram and Prof. John Pickford, I consider it is an honour to be called upon to propose the vote of thanks. Every organisation collects a heavy debt of gratitude en route to achievement of objectives. We are no exception.

It was more than a year ago when Prof. Pickford came up with a proposal for hosting this Conference. The objectives of the proposal being complementary to the Regional Centre's, we readily accepted to host the Conference. It was Prof. T. Navaneeth Rao, our revered Vice-Chancellor who was the source of sustenance throughout; and therefore, though he is not present here today, we wish to convey our deep sense of gratitude to him.

Shri T.L. Sankar, we certainly owe our thanks for conceding to our request to be the Chief Guest and to inaugurate the Conference.

We thank Shri P.S.A. Sundaram who, though the Parliament is in session, agreed to our request to deliver the Keynote Address. The combination of administrator and academic which you represent has certainly queered the pitch for the Conference and I assure you that the Conference will certainly succeed in analysing the issues which you brought out so eloquently.

Shri B.V. Rama Rao, has been a constant source of inspiration and we thank him for his benevolent guidance in organising the Conference.

We are grateful to Prof. John Pickford who was instrumental in obtaining the opportunity for hosting the International Conference.

A large number of organisations have come forward in providing the infrastructure for the Conference. We believe such gestures go a long way in binding the academics and professionals together. I take this opportunity to thank every one of them. We are particularly grateful to the Institution of Electronics and Telecommunication Engineers who have made it possible to use their auditorium for the Conference. Last but not least, we are thankful to the Press, the All India Radio, the Doordarshan and Shri R. Suryanarayana Reddy, Public Relations Officer, Osmania University, who have spared no pains in providing the necessary publicity support. A large number of participants from far and wide, representing over 20 countries have already registered, indicative of their interest in the upliftment of the poor and development of infrastructure. We, as the hosts and co-organisers, are grateful to all of them, and I take this opportunity to assure them of our endeavour to make their stay purposive and comfortable.

Thank you one and all.

PLENARY SESSION 1:
Communities, women and NGOs

16th WEDC Conference

Infrastructure for low-income communities

Hyderabad, India 1990

Women in Infrastructure - Bangladesh experience

Ferdousi Sultana Begum

1. INTRODUCTION

With an agrarian economy and low industrial base, very few mineral resources, Bangladesh is one of the poorest countries of the world with a large population having uneven distribution of available wealth. The high population growth rate leads to lower income, high unemployment and underemployment rate. About 80 percent of the total population live in rural areas and more than 56 percent of the population have no land or have less than one half acre of land including homestead. The existing state of physical infrastructure is not conducive to facilitate required level of industrial and social development.

Women constitute about fifty percent of the country's total population and are one of the most affected section of the society. They have to work from dawn to dusk whereas their work is not valued economically. The life expectancy of women is lower than that of men and at least one woman dies per two hundred live births. Average age at marriage was 17.9 years for women in 1987 compared to 25 years for men. Female literacy rate was only 16% compared to 31% for males in 1981 Census.

The Bangladesh Labour Force Census of 1985-86 found that about 34.2 m women were in the working age group of which only 3.2 m were in the civilian labour Force and 24.9 were in household works. According to an estimate of UNDP in 1989, 60% of women were working in agriculture off farm employment and 25% households were headed by women. During the decade ending in 1985, women participation in the labour force increased by 10% as compared to 2% for men. It was also noted that 14% of mean earned Tk 75 or less but 75% of women fall under this category. Also they are to compete hard to find a place in the work force and are restricted to low paid, casual and stereotyped occupations.

Involvement of women in infrastructure development activities could offer women a wider role in the economy though their involvement in such activities is very rarely thought of in the existing social context.

2. RURAL DEVELOPMENT STRATEGY

Government of Bangladesh has declared its strategy for rural development as a means of national development based on the perception that the economy is mostly rural through a Sector Policy Paper in 1984. The three major components of the strategy are:

- Development of physical infrastructure including roads, storage and markets.
- Irrigated atriculture, minor drainage and flood control works.
- Production and employment programmes for the rural poor.

All these three components are complementary to each other. Infrastrcuture development is one of the preconditions for socio-economic development. Physical infrastructure is particularly required to facilitiate availability of all the development inputs.

The involvement of women in all these three components is aimed at bringing them into the mainstream of the economy, and, therefore, has been taken up by the government as its strategy. The Fourth Five Year Plan (1990-95) of government of Bangladesh has highlighted the issue of effective participation of women in development both for increased welfare of women and development of the country.

3. EMPLOYMENT

Every year about eight million new job seekers enter the labour market. High rate of inflation along with natural disasters during the post liberation period reduced the purchasing power of the middle and lower class families. Many women have become widows, which compelled them to come out of their homes and join the labour force. A large number of these women have turned out to be the principal breadwinner for their families. The entry of women into the labour wage market is primarily induced by poverty.

Employment opportunities in the agriculture and industrial sector are too meagre to meet the needs. The formal sector is too narrow and opportunities for creating new job avenues are limited. Therefore, there

remains the need for creation of employment opportunities in the rural areas.

The Planning Commission estimated unemployment on a person year basis at 37.9% in FY 1984-85. The 1984-85 LFS estimated that about 90% and 60% of the rural and urban paid workers and day labourers, respectively are below the poverty line income (defined as Tk 249.44 and Tk 232.51 per month per person in the urban and rural areas, respectively). Low wages and poverty also have a strong seasonal dimension in Bangladesh. Wages vary with seasons partly because of changes in the number of hours worked and also the availability of water employment (particularly in agriculture) during the year. Most economic activities still take place at subsistence level. In many places in rural Bangladesh the daily value added by female members for a whole day's work at home is as low as US $0.30 per day.

Agencies endeavouring towards creating employment opportunities have involved women in infrastructure building and maintenance activities. Since most of them reside in the rural areas, their involvement in rural development activities gives them employment as well as a sense of participation in national development. This has given women a wider role and shown good response, thus neglecting gender considerations contributed towards nation building. Women have been involved in infrastructure building and maintenance activities on seasonal and regular basis requiring arduous physical labour under different agencies.

3.1 Women in Infrastructure Building

During the post liberation period mainly the destitute women came forward to participate in the infrastructure building activities under Food for Works Programme (FFW). The incidence of increasing female headed households during the post liberation period due to widowhood and desertion contributed towards female participation in infrastructure development activities. These activities included construction of rural earth roads, embankments, excavation and re-excavation of canals, drainage post monsoon rehabilitation works etc. Labourers are given wheat as their wage. Locally initiated schemes are given priority under this programme. At the initial stage women were given wheat at a special rate. Considering the physical weakness of women they were given higher amount of wheat for equal work if the scheme was implemented completely by women. Women working for the schemes which were not implemented by women were given wheat at the same rate as men. This system is continuing until now.

World Food Programme (WFP) initiated a Post Monsoon Rehabilitation (PMR) programme during the 1984 post-monsoon season. The programme was intended to reconstruct the damaged roads in usable condition using women labourers for a few days paying their wage in food. This project has been expanded in 2300 unions by the year 1988. Women work in a group of five members for rehabilitation and receive daily wage in wheat on the basis of the quantity of their work. During the year 1989-90 about 1,879 such schemes were implemented in 237 upazilas of 42 districts. During the year 1988-89, more than 150 million mandays of lean season employment was generated through FFW and a substantial part of this was for women.

WFP also supports destitute women in the rural areas through its Vulnerable Group Development (VGD) programme. Selected women are given wheat for two years as supplementary feeding of nutritionally vulnerable mothers and their children with the intention to rehabilitate them. In recent years, emphasis has been given on the rehabilitation and development aspects which include health training, functional education and income generation. A compulsory saving component has been included for generation of seed capital for self-employment. In FY 1988 the programme reached about 1.5 m beneficiaries.

Most of the badly affected roads which need major repair are brought under rehabilitation programme and other roads requiring minor repair are brought under maintenance programme.

Local Government Engineering Bureau (LGEB) under Ministry of Local Government, Rural Development and Co-operatives is primarily involved in building rural infrastructure through local bodies. The Infrastructure Development Project (IDP) of LGEB has involved women mainly in construction of earth roads, embankments, excavation of canals etc. Under Rural Employment Sector Programme (RESP) this project aims at building, maintaining and rehabilitating rural infrastructure to increase production and improve communication raising direct and indirect employment of men and women. Different other government and non-government agencies are also involving women in infrastructure building activities.

The LCS Concept The usual modes of construction of infrastructure development schemes under the Local Government System

are "Contractor" and "Project Committee (PC)". A new and innovative mode of construction in the name of Labour Contracting Society (LCS) was introduced on experimental basis from 1983-84 under the Intensive Rural Works Programme (IRWP) funded by SIDA, NORAD and DANIDA. This mode has continued under Infrastructure Development Project (IDP) of the Rural Employment Sector Programme (RESP) financed by SIDA and NORAD. Under this system, formal or informal groups of landless labourers are given contract directly for construction of small infrastructure development schemes and other earth work schemes under IDP.

The objectives are to:

i) Directly involve the landless groups in infrastructure development work.
ii) Eliminate intermediaries.
iii) Provide employment opportunity and additional income to the landless groups.
iv) Ensure fair wage.

The LCS have been involved in various types of infrastructure development activities under IDP. Examples are indicated below:

a) Locally initiated earth work schemes.
b) Schemes undertaken by women (Earth work)
c) Re-excavation of Government ponds and ponds belonging to Local Bodies and other Institutions.
d) Earthwork for construction of embankment.
e) Excavation/re-excavation of canals.
f) Earth Work for construction of road sections of feeder roads (Type B Crest with 7.31 m with 3.65 m pavement).
g) Development of Growth Centre and Related Infrastructure.

Composition and Formation of LCS An LCS is defined as a group of landless men or women labourers, organized by Government or non-government organization (NGO) or IDP directly to implement small earth work or other types of schemes under IDP on contract. The members of LCS represent households of landless labourers who depend on manual labour as their main source of income and who do not own or operate more than 0.5 acres of land. The number of members of one LCS is around 30. The members of the LCS select, from among themselves, one Chairman and one Secretary.

The total cost of one contract with the LCS does not normally exceed Tk 75,000. If a larger scheme is identified for implementation of LCS, it can be divided into several portions, but one LCS does not get more than one contract at a time.

Identification, Preparation and Approval of Scheme LCS schemes are normally identified by formal and informal groups on the basis of discussion with the Upazila Engineer (UE) and the District Engineering Advisor (DEA) of RESP. Such schemes are implemented by the Upazila Parishad.

Training to LCS Members The LCS members are imparted training by IDP preferably prior to commencement of work. In exceptional circumstances, such training is imparted shortly after commencement of work. The training covers social, motivational, technical and management aspects on the basis of a Training Module prepared for the purpose.

The LCS activities have been gradually increasing under IDP. Significant increase has been recorded during 1987/88 and 1988/89. The LCS system has appeared as a viable alternative to traditional ways of organizing labour. In the northern part of Bangladesh during 1989-90 rehabilitation work of a large cross dam and embankment which was damaged by 1988 devastating flood was completed employing 67 LCS of which 7 were women LCS groups.

In these groups, the labourers have gained at least some influence over the working conditions. They have also proved their capability to cope with local problems, such as, access to soil during scheme construction, modest increase of bargaining power at the local level etc. In addition to some direct benefits to the landless groups in the form of direct employment opportunity, fair water and additional income, experience shows that the technical quality of LCS schemes has been achieved at a higher level compared to schemes constructed through the Project Committee and the contractors.

From the positive experience gained during the past few years, there are valid grounds for extending LCS involvement into a great variety of different more qualified activities under IDP. It is a success story which other infrastructure development projects are considering to adopt. During 1988-1989 a total of 11,377 labourers worked generating employment for 661,732 labourdays through LCS. Among these more than 100 were women LCS employing around 3,400 labourers. Under women schemes all construction work was done by LCS. Besides, women were involved in different other components for short term employment.

It has been observed that the quality of construction works done by women was comparable to and even in some cases

better than the works done by contractors. Considering the price hike and inflation the cost limit of an LCS contract has been raised to Tk 100,000 for LCS in 1990-91.

Recently efforts are being made to develop the LCS as prequalified groups to shoulder bigger responsibilities. The cost of the scheme in these cases would be upto Tk 200,000/- and contract would be given to selected groups based on their past performance.

3.2 Women in Maintenance

Maintenance of earth road in rural areas has been found to be a successful area of employing women. Women have proved their worth in rehabilitation and maintenance of quality earth roads. Maintenance programme is a very recent effort in Bangladesh. In January 1983, a model was taken for earth road maintenance under IRWP and subsequently it was expanded to all upazilas of Faridpur district within 1985-86. Presently the activity named Routine Maintenance (RM) is being implemented in all upazilas of Faridpur, and Madaripur district and three upazilas of Kurigram district under RESP. Presently more than 1600 women are involved in RM activity on wage basis and maintaining about 1300 km of earth road in three districts.

There are two other models of earth road maintenance being followed in Bangladesh ie CARE and DANIDA Model.

All the three models work by employing physically fit destitute women within the union. Women who come from the lowest economic strata, who have to sell physical labour and mainly those who do not have a male earning member in the family are selected as maintenance labourers. RESP takes into account the distance of worksite from their home.

Training is provided under the three models on technical and social aspects.

Earth road maintenance by employing women does not require high technology and mainly require the following activities:

1. Filling of rain cuts, pot holes, ruts and depressions.
2. Repair of collapsed sections and bridge approaches.
3. Cambering and maintenance of shoulder and side slopes.

The activity is related with the judgement of using appropriate soil, control of soil moisture and compacting loose surface, stockpiling of suitable earth during dry season.

The maintenance programme under the three models though implemented by women, show some distinct difference in the mode of implementation.

All these models show a good response from the women of the lowest economic strata. Studies have found that though the work demands hard physical work yet the women are ready to continue with these jobs since they found it more rewarding than other available jobs.

RESP and Sanida programmes are closely supervised by full-time supervisors. The agencies give importance to the total maintenance rather than patch repair. The roads maintained by women could be retained in trafficable condition throughout the year.

Besides, road side tree plantation and maintenance, growth centre cleaning and maintenance, etc have been taken up as women activities under different development programmes. Particularly tree plantation and maintenance is aimed at:

- creating long-term employment for women
- protection of earth road from erosion
- environment protection

Some NGOs are also working to involve women in similar types of infrastructure building and maintenance activities. Most of these are through FFW and with donor's assistance. Besides, many women are working as labourers for breaking bricks, carrying water, mixing cement and other activities under contractors. No statistics are available on this type of participation by women.

4. CONCLUSION

Within Bangladesh scoiety the work that women performed in infrastructure construction and maintenance had for ages been reserved for men. Women were considered incapable of engaging in such out of home manual work. Since women's sphere of activity is considered to be the home till now most of the development projects envisage activities by women in production process within the courtyard of their homes. The infrastructure workers have overcome this barrier and come out of their homes breaking through the conventions.

The regular employment under maintenance programmes could assure regular meals to the families. Somewhat better standard of living has been gained. The positive social

impact is that these women could gain some position in the male dominated community. They are now the decision makers of their families and in some cases they are consulted about matters relating to the neighbourhood. The women feel confident in their new role since it does provide them with food, though it increases their workload. The traditional outlook of the community is also changing and opposition and hesitation is over. More and more physically capable destitute women are eager to work in these types of activities.

The women have experienced social changes and even shop owners do not hesitate to sell food stuff and clothing on credit which was almost impossible before. At the same time the rural roads are remaining in usable condition, which reduces miseries of common people.

Destitute women being involved in the maintenance activities could improve their socio-economic status. Many of them had to depend on begging for their livelihood before joining as maintenance labourers. A study has found that many of them now could create their own savings and assets. The assets include, livestock, poultry, rickshaw/van, sewing machine, tin roof, small plot of land etc. This change in their economic position has further resulted in increased self confidence. Some of them invested their savings for further income generation, improved housing structure and sent their children to school. Perhaps these women are practically the only rural inhabitants with a regular job and cash income outside of government functionaries.

The short-term employment under Food For Works could assure employment for women for about two months a year and then they are to survive for the rest of the period on their own. Involvement of women in LCS activities, though, provides them with job for about two months a year and they try to save something out of their contract money which they use for self employment for the rest of the year. The new role of contractor under LCS has given the women a sense of responsibility. The training imparted to them and the work itself helps building group cohesion, self reliance and sense of participation and even they can bargain on their rights together.

All these programmes gave access to commercial banks to the poorest section of the society. Operation of bank account, contact with bank and other officials, help them in thinking of a better future. The training helps them to boost up self consciousness.

Women can be given long term employment in the infrastructure sector only if there is a need for asset maintenance during and after completion of the work. Maintenance of earth roads, HBB roads and structure, casting of pipes and slabs etc could easily be done by women through providing some skill training.

In order to minimize the need of direct competition with men, new areas of activities are to be identified to provide short-term employment opportunities through LCS, like rehabilitation and construction of roads, tree plantation, low cost sanitation and irrigation schemes etc. Proper planning would provide steady income to the poorest segment of the society. The activities may include:

- laying of HBB in market/road
- production of pit latrine materials
- raising of land in different public institutions
- re-excavation and cultivation of private ponds (on lease/share)
- utilization of Borrow pit (fish cultivation, farming, afforestation)
- Khoa consolidation pavement (mixing)
- creet way
- tubewell maintenance
- irrigation drainage/buried pipe
- embankment maintenance
- HBB/structure maintenance

One important thing is that all these activities demand hard physical labour which women may not be able to continue for long. Also women having small children find it difficult to work in such activities. It is required to make arrangement for alternative employment opportunities for these women. And the maintenance workers work on no work no pay basis. And they also require to be motivated for self-employment.

The socio-economic benefits reaped by the women under different programmes are apparent. Their outlook and attitude has been changed and aspirations are also visible. This in itself speaks for the successful efforts of the initiators of different projects.

More and more light jobs in infrastructure development activities require to be identified for greater involvement of women in nation building activities. This in the long run would improve the status of women and help them achieve equal rights and same treatment as men.

Withdrawal of project assistance in construction, maintenance of infrastructure and physical incapability should not put these women in unemployment. Since the

construction labourers remain unemployed for a substantial part of the year, they require alternative employment opportunites. Necessary planning and steps should be taken in this respect. Creation of self-employment opportunities through skill development and capital formation could be an alternative. On the other hand, the women need to be aware about their own situation in the society as well as social, health and other facilities are other important dimensions. They are to be provided knowledge about basic health care, education, immunization etc, for improving their social condition.

Involvement of women in infrastructure development activities for an alleviation of poverty and employment generation in Bangladesh has now been proved to be fruitful. It is felt that a national strategy be formulated to involve women in the light activities of infrastructure development projects under different development agencies. Women participation could be increased through establishing linkage with the VGD beneficiaries and involving them gradually in infrastructure building and maintenance activities.

Women have been found to be capable of doing earthwork efficiently and almost all infrastructure development projects contain some earthwork. A strategy should be developed to ensure women participation in at least 50% of the earthwork schemes constructed by different agencies. Particularly WFP could contribute substantially in this respect.

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Women's participation strengthens NGO projects

Vijita Fernando

Peoples' participation in community activities prevailed in Sri Lanka long before the term community participation became fashionable in modern development jargon. Self help groups, the forerunners of today's formalised Non Governmental Organisations (NGOs) existed in remote rural areas. In a country where 65 percent of the people live in rural areas, these were widespread as active, dynamic informal groups helping one another in activities directed to the common good.

Today community participation is acknowledged as an important tool in the country's mainstream development programmes such as the Integrated Rural Development Programme, the Million Houses Programme, the Janasaviya or Poverty Alleviation Programme of the government and in all development projects of the NGO sector.

Till a decade ago community participation meant men's participation with the women at the periphery - fetching and carrying and providing the men with hot meals and cups of tea. Several factors combined to make planners take a closer look at the enhanced roles, women could be called upon to play. Women's participation in development was already being highlighted through the UN International Women's Decade and the Year of the Child. This spilled over to the International Drinking Water Supply and Sanitation Decade (IDWSSD). Social Justice, equality and elimination of gender based discrimination in the development process were constantly being talked about. There was a particular emphasis on women's participation being crucial to achieving improvement in the health of the people through improved practices in water and sanitation. Women, half the world's human resource could, it was accepted, contribute positively to building sustainable systems both in their capacity as beneficiaries and as partners in development.

NGOs were also taking a closer look at the failure of water programmes. With their close links with the people and empathy with popular needs, it was not long before they faced the fact that without a supportive partnership with women, water/sanitation projects will always fail.

Involving women was not as easy as facing this realisation. Women's participation meant different things to different people, to different communities. Cultrual and traditional practices and taboos had to be tackled just as strongly as men's and other elders' attitudes. Women's own conditioning to traditional attitudes, superstitious beliefs about water and waste disposal, which abound in Sri Lankan lore had to be overcome. The biggest stumbling blocks however, were not attitudes and beliefs but apathy and indifference born of poverty, constant ill health and malnutrition.

Innovative NGOs wooed women's participation by providing health clinics for their children. Women always respond to these and bring all their children to be measured, weighed and examined by a doctor/nurse team. The captive audience of mothers is treated to posters, flash cards, skits and illustrated talks on safe water and hygiene and the way is for a smoothed water sanitation programme.

WOMEN'S NGOS

Women's NGOs have the edge over others in winning women's participation. Talk of toilets and elimination of waste is easirr between women and women, as the Girl Guide Association of Sri Lanka found in Peenatipone, a little village in the central hills. It was a woman's story all the way, when a Buddhist nun, a former Guide, gifted land in the village to the Guides to set up a Centre. A resident Guide lives here as project officer and the Centre provides a meeting place for women. The women identified water and sanitation as basic needs. The men cooperated with them and the NGO as Guides are a respected community known islandwide in Sri Lanka.

The women admitted the need for toilets, for separate wells for drinking water and for bathing and washing clothes. They decided on the sites and took on the role of managers. Five years after the three wells and eighteen basic toilets were built, the women are still in charge. The toilet superstructures are now rather dilapidated but the insides are dry, clean and fly free. The men assist with occasional thatching of roofs and leave the credit of hygienic use to the women.

The wells are in mint condition, the aprons sparkling clean and the divisions of washing, bathing and drinking are as strict as ever. There are informal caretakers - women of course! - supervised by the Guide project officer. The caretakers keep the surroundings clean and flush the drains to prevent them being blocked with mud during the rainy season.

Women's participation in the water sanitation programme has given them new insights into their capabilities - several small income generating activities have been started and links have been forged with government agricultural and medical extension services to facilitate these, and set up a nutrition centre in the village. Four other villages have enrolled their women in these activities and in March when we visited the project there was one query - when are we getting wells and toilets for other villages? This is the very satisfying challenge that the Guide are now facing!

TECHNOLOGY

It is not easy for the sophisticated western mind to grasp the attitudes of simple rural people, especially women, to deep wells and hand pumps. A well to them is an open well where one can see the water sparkle when the sun plays on it. A certain kind of tree growing by it, its roots caressing the water means that the water in that well is pure and safe to drink. The branches overhanging the well keep the water tasty and cool. Certain kinds of fresh water fish in the water improves its quality. Resistance to using water that they do not see inside a tube well which comes to them through a pump can be grasped only if one appreciates these beliefs.

But where nature has not been so abundant with rain as in Heenatipone, deep wells and hand pumps are the only answer to women who have to walk miles to water holes ponds and drying streams for small quantities of water for drinking, in the dry north central and north eastern parts of the country. Winning womens participation for water projects here is a different story from areas where water is plentful. Sarvodaya, a large NGO with projects in 5000 villages islandwide has a success story.

Sarvodaya's development programmes had low participation from women in many of these villages. Water borne diseases, low productivity of the women, excessive time spent in water collection and storing were some facts that Sarvodaya identified. There was an overriding need to provide a simple low cost technology for safe drinking water conveniently at hand in there dry areas. The Sarvodaya plan was a costly one supplemented financially and technically by the International Development Research Centre, Canada and backed by research by Sarvodaya Workers. Padiyatalawa in the eastern province dry zone was selected and ten villages were identified for this innovative ambitious plan of involving women in manufacturing, repairing and maintaining hand pumps.

The first programme involved 20 girls. Ten girls were trained for two months in all aspects of technical details for constructing wells. The other ten were trained in planning fitting, welding lathework and smithy work required to manufacture handpumps, at the Sarvodaya's own engineering division close to Colombo. The final training was in assembling the handpumps in monitoring, maintenance and evaluation of performance.

A central workshop was built at Padiyatalawa and equipped with machinery to manufacture handpumps. Later ten subsidiary workshops were built in each of the slected villages to assemble, repair and maintain handpumps in use in the village.

UNFEMININE?

It was not too difficult to select a suitable handpump which pleased the women. But Sarvodaya had many problems in selecting women to be trained. Technical work was not that fathers wanted for their daughters. Married women had other chores, so the selectees were unmarried girls between 18 and 25. Six dropped out of the first batch when they were repeatedly told by fellow villagers that their chances of finding a husband would be minimal if they continued to repair handpumps - an exclusively man's job and so unfeminine!

The programme, in spite of these drawbacks has been successfully carried out for six years. Sarvodaya achieved among many things women's participation in the technological aspects of water provision. After the initial hurdles it won men's approval when it was found that men did not have to run to the pump and repair it every time some little thing went wrong! The water problem was solved and later when Sarvodaya changed its thinking and recruited young married women who had greater leisure and did not face the prospect of leaving the village for employment, the project worked even better. It is steadily growing and spreading to other water starved areas today, and in every one of the projects Sarvodaya has won hundred percent women's participation.

There is another aspect to this programme. The entry of rural girls into the field of water technology in the kind of exposed environment contrasts with women's scientific

work behind closed doors in urban laboratories. This is a major breakthrough in changing traditionaly demarcated male and female work spheres and gender role perceptions that still prevail both among the women themselves and in society in general.

HEALTH WORKERS

In Punchiwilaththawa's water/sanitation programme by the NGO Water Supply and Sanitation Decade Service (Decade Service) young women played a completely different role from the Sarvodaya programme. The village based NGO identified health education as a first priority when the Decade Service was able to get six open wells and sixty five basic toilets for its 250 families. Twenty five young school leavers, all under twenty five years of age were selected for training, first by the Decade Service and health extension staff in the village and later at the town hospital eight miles away. The training was in all aspects of health education. The focus however, was on safe water and sanitation. Long before the wells were ready or the toilets were completed, each girl had in her purview ten households where mothers, grandmothers young women and children were given the message of safe water and sanitation by the girls. Keep the wells clean, buckets away from contamination and pass on these messages to the family's children, the girls exhorted, on their daily home visits.

Sometimes the girls were in tears! With the best of motives each girl was given the ten houses in her immediate neighbourhood whose inmates were people she had known all her life. The O. Level educated health volunteer had been the little girl the fimilies had watched grow, smiled at every time they passed her in the village, met at the temple and at the market all her young life. Now she became an outsider, someone coming with an air of authority to tell them how to run their lives! It was tough.

But the girls won the women over and soon under the village spreading trees there were talks on safe water and hygiene illustrated with huge posters provided by the Decade Service, weighing babies, making notes and boiling water and storing them in large earthen containers covered with scraped coconut shells for safety. The girls also learnt to conduct simple surveys and within the next two years converted an unused school building and set up a nutrition centre. Weekly a nutritious meal of leaves and grains from the neighbourhood was cooked and distributed to pregnant and lactating mothers and children.

The Decade Service was able to leave the project sure of its sustainability in these capable young hands. The six wells and sixty five toilets were only the hardware for a spin off effect of better nutrition, cleaner habits and more educated mothers - and of course, women's participation at every stage.

WOMEN MANAGERS

The Lanka Mahila Samiti (LMS) is one of the oldest women's NGOs in the country with a network of training women at community level in all 24 districts. When it launched on a water/sanitation programme in a dry zone village of 140 families where already a committee of trained volunteers worked at grassroots level, it went in with the philosophy that women should be involved in water and sanitation schemes not because it is they who go to the well and carry the pot of water, but because "women are a potential human resource and if they are actively integrated in water programmes at every stage there could be a definite impact on their own development".

Water and sanitation had only to be mentioned in this village and there was a ready response, from both men and women. This did not happen when other development activity was discussed - nutrition, family planning, even pre schools.

Building on this response the LMS got the women to do a house to house survey to get the actual water/sanitation picture, available water sources, toilets that were needed and then draw a map of the village. The women selected the sites, pinning flags on the map. To some women this was the first time they had seen a map, let alone drawn one! The LMS active involvement was only to assist them to get the funds. The women opened a Bank Account handled all the accounts, bought the bricks and selected the toilet sites with the advice of the health officials.

The women supervised the work and some were acutal bricklayers masons and combined these roles with those of monitor/evaluator.

Daily evaluations were conducted with the extension workers using LMS techniques of participatory evaluation.

Almost from the start of the project the women had gained a new status in the village. They specified the bathing hours at the wells and were ready to settle quarrels over the use of water... but they had a tough fight. First, they had to overcome their own

inhibitions, then the attitude of their men and the men's interference. How much the men were convinced we will never know. But after some time the husbands, male officials in the village, the school teacher and the monk in the temple agreed to let the women handle the project - they saw a new role for the women, other than cooking their meals and waiting on them.

The promise of the project could not be seen in full. No evaluation was possible. The pojeect had to be abandoned some tije later due to terrorist activity in this part of the country. But the LMS is determined to repicate the idea in another village to enable women to win greater participation in water/sanitation programmes as a stepping stone to being full partners in other areas of development, gaining a new status in their communities and fulfilling their potential.

A CONTRAST

The Kitulawa project - a small wet zone village subject to periodic flooding - is a study in contrasts. The provision of basic toilets to this rural community was a Guides project where a conscious effort was made to involve women in mainstream activities in sanitation and water. The Guides used the pre school related Mother Group as a focal point for dicussion on health and nutrition problems and their relationship to water and sanitation, thus motivating the women to participate actively in the programme. The 100 toilets were completed on schedule, sited where the women wanted and health education going on space long before they were completed. A visit this year - six years after they were completed - confirms their use and hygienic maintenance. The health officials report positively that diarrhoeal disease is much less. The toilets still look good, their floors have no cracks the roofs are in repair and the doors lock securely.

The six deep wells that were given to the village at the same time show less success. Women's participation was symbolised only by one of the wells being dug by the women. The participation ended there and six months after they were completed the handpumps were rejected by the community. The water from the tube wells was used only for washing as the women did not "trust" the water. Drawn through a handpump was it safe enough for drinking ? There was a rusty colour and taste and the women did not use it for cooking. They did not even like to bath in the well water as the "hair turned brown". Today, six years later we find that the handpumps in three of the wells are not in working order.

The iron removal filters fitted at a later date for controlling excessive quantities of iron were broken and the pump in the well near the pre school which serves as a demonstration unit to the community is in a state of disrepair. The pre school kids have no source of water at hand.

The trained pump caretakers are all male and only one lives in the village. There has been no response to requests to have the pump repaired which is serious and needs expert help. Earlier there had been other development activity for the women, skills training in handicrafts batik printing and packeting condiments. Today there is no evidence of sustenance of women's involvement, though the pre school remains a potential focal point for such development.

SHARING EXPERIENCES

These are not great success stories of NGO efforts of winning and sustaining women's participation. But they are a good begining. Sri Lankan NGOs will always require special efforts to achieve women's participation and will need to address cultural constraints and barriers to women's particiaption in public.

Male attitudes must be overcome. More women in NGOs and more women's NGOs will have to be catalysts to involve women at every level. Women's role models are needed for rural women to be more confortable assuming new roles. The basic idea that water and sanitation is a masculine field will need to be revolutionised and the entire field feminized.

It has taken a decade for this process to get going. We have thanks to NGOs, reached a point where no longer is the concept to women's participation a source of amusement and resistance. At the highest levels they are realising the importance of full participation of women. But questions remain. The most important is 'how' in our little village, in my developing country, do we win the full participation of women? The strategies may not be so different from your little village in your highly developed country. Let us share them.

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Infrastructure for low-income communities

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Rural women in sanitation programmes

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ABSTRACT

As a part of an integrated water-sanitation study 754 twin-pit latrines were provided to about 4500 people of two villages in Mirzapur subdistrict, Bangladesh. Women were motivated to contribute in the ownership of individual family-based latrines. They were encouraged to participate in site-selection, construction of latrine superstructures, and maintenance of the latrines. More than 91% of the latrines were in use. Local women participated in the construction of more than 60% of the Project-community built 280 latrine superstructures. When pits of 276 latrines needed desludging, local women with some training from the project desludged 65% of the pits at a cost of about one-fourth of the price demanded by professional scavengers. These participations by the women was accepted by the society and since the area is representative of the country, this finding has implication for sustainable and effective use of two-pit latrines.

INTRODUCTION

Although investments in water supplies had grown rapidly in the post-war years, sanitation had been largely neglected. In 1985 the percentage of population in rural areas of developing countries with adequate access to sanitation facilities was 18% compared to 41% in water supply of the same area "(ref.1)". Only 3 countries out of the the selected 9 of the South-Asian region are likely to meet their national rural sanitation target for International Drinking Water and Sanitation Decade by 1990"(ref.2)". Bangladesh had it's target set at 13% coverage and is most likely to meet the target. Only about 5% of its population has sanitary latrines. But more than one studies have found significant association between use of sanitary latrines and childhood mortality and morbidity "(ref.3,4,5)".

This study presents benefits experienced in a rural sanitation programme by involving local women in it's different stages. The sanitation programme was a component of the Mirzapur Handpump Project which aimed mainly to evaluate the health impacts of integrated water, sanitation, and hygiene education intervention.

PROJECT DESCRIPTION

The Mirzapur Handpump Project was funded by Canadian International Development Agency through UNDP/World Bank and conducted by International Centre for Diarrhoeal Disease Research, Bangladesh, in rural areas of Mirzapur Sub-district. The project has launched in early 1984 and the field activities ended in December 1987. During this study improved water supplies, two-pit water-seal sanitary latrines and hygiene education were provided to the people of two villages (intervention area). Handpumps were provided free of cost, on aberage 1 handpump to about 30 people. But the latrines were sold at a subsidized cost to encourage a feeling of ownership in the users. The details of the Project may be found in literature "(ref.5)".

The intervention population comprised approximately 800 households and 4856 people. About half of the people were female and approximately 89% of the adult women were housewives. In older than 15 years people 58% male and 83% female could read or write. About 70% of the households were muslim and agriculture was primary or secondary occuation of more than 44% of the people.

SANITATION PROGRAMME

Acceptance of latrine

Around the end of 1984 the people of intervention area was formally approached with the concept of latrines. More than 97% of the people were habituated in fixed place, unsanitary way ofdefecation practices. Following this community approach of motivation extensive door to door visits were undertaken to make the housewives realize the importance of latrines in health benefits.

Housewife of every household was requested to contribute about U.S.$ 10 for a latrine, which is about 30% of the actual cost. After some motivation the relatively more wealthy families agreed to buy latrines, and these served as demonstration latrines to encourage other household to invest. In total 754 households agreed to take latrines and 2.6% of the households paid the requested full payment. But 54% (409) of the households contributed some money with

The agreement of paying more at later dates. Since project staff contacted housewives it was them who motivated the male members of their families to take the latrines.

Latrine installation

The project had certain criteria for site selection of a latrine and one of the most important ones was to ensure it's social and cultural preference by latrine's users. The housewife and female members of the family were invariably requested to participate in the selection of the site and they always did that.

When it was observed that female members of the household often supervised the installation of their household latrines project staff explained the housewives about installation requirements. It was decided that the installation contractors would be paid for a latrine at completion report from the respective household. This agreement helped to transfer the knowledge of technology in the community, to promote ownership feeling in the users and to provide dual supervision on the quality control of the installation.

Households were than given the responsibility of building their latrine's fencing. But about 36% (268) of the latrines were found to have no fencings. The households were either unable or reluctant to build the fencings. Twelve groups, each with 2 males or 2 females from the area, were contracted to do the work at the rate of about U.S.$-0.27 per latrine. Out of these 12 groups 8 groups were formed by females. These groups motivated the members of the households to provide materials (Jute sticks, bamboo sticks or at least jute sacks) for fencings. They then built the fencing at no cost to the household. Out of 268 fencings more than 50% were built by women groups.

Latrine use

About 91% of the latrines were used by the households. Females, in general, used latrines a little more than males (about 89% females and 87% males). More than 70% of the children in 3 to 5 years of age used the latrines. However, only 20% of mothers threw the feces of younger children in the latrines.

Maintenance

Female members of the household were told to keep the latrines clean and make the cleaning water available near latrines. Majority of the latrines (73%) were found clean and free of foul smell by the observer. Sixty nine percent of latrines had a water pitcher available nearby (containing some water in 95% of cases).

Local women were also involved in desludging (emptying) of latrines. They were trained to do the job in hygienic way without polluting the area and contaminating themselves. During the desludging work fifteen community women emptied the contents of 178 pits (about 65% of 276 desludging pits) in groups of 3 or 4 women. These groups did their job efficiently at a very competent price. They were paid about US$ 1.2 equivalent per pit.

DISCUSSION

The children in the intervention area experienced 25% less diarrhoea than the children in the control area "(ref.5)" and there is little doubt that such an achievement could not be possible without success in the sanitation programme. In this study local women were found to participate in all phases of the project.

The community seemed well satisfied with the latrines, after their initial reluctance. The high usage rates by adults and children aged 3 years or more were impressive. The mothers must have taken special attention to keep the latrines clean, make the water available at use and to make the children use the latrines. However, the low use of latrines for disposing younger children's feces need to be carefully considered in future sanitation programme.

There are obviously economic constraints in a poor community such as Mirzapur, and it is likely that other household expenditures were given priority over sanitation. Thus, it was encouraging to observe that the housewives of the majority of the households could convince their male members to accept the proposal. Studies could be undertaken for recovery of full cost by providing alternate cheap technologies or system for collection of money in instalments.

Women's participation in site selection and latrine installation had implications for likeness, comfort, convenience, and ownership feelings, and hence, for effective use.

Women in the fencing construction groups helped the project to promote the use of latrine in women community where male cannot get easy access due to purdah tradition. Furthermore, when household women saw that the women labours were constructing their fences they came forward to help them in every possible ways.

The participation of local women in the emptying of pits was another significant achievement for the project. Desludging of the pit was not foreseen and so it's cost

was not included in the project budget. At that closing period of the study the project could not have afforded to hire the professional scavengers who intentionally demanded a high cost and were planning to take actions against the project if it attempted to hire scavengers from other area. Local women helped out the project at 20% of the demanded cost and the work within the span of the framework. Desludging by local women has an implication for sustained and effective technology transfer in the community. Because, desludging in general, belongs to a professional group of the society. Local women doing the job without objection from the community could be taken as an indication for community acceptance of such act.

Therefore, the rural women played an effective role in the success of the sanitation programme.

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Skill development for poor urban women

K. Prasada Rao

'Women constitute half the population and are critical to the production and social process of the economy. .... They have been managing and supporting the survival systems, particularly in the case of the poor households constituting about 30 per cent of the population. The programmes for alleviation of poverty should thus have a strong focus on development of women. In the Eighth Plan, women will be accorded a special role in the scheme of .... mobilisation of local skills and resources. With this end in view, ... measures towards training for skill formation, ... and increasing access to productive assets and other resources will be intensified . ..... The first step is a recognition of the dignity of women's work and a proper understanding of its dimensions and contribution in the Indian context.'[1]

2. Keeping in view the social responsibility of providing gainful employment to the urban poor women, several schemes have been initiated by the Central and Provincial Governments in India during the last four decades of planned development. Thus, a scheme for setting up of employment and income generating production units by women was started in 1982-83. Under the scheme, women belonging to the less privileged sections of the society are being trained to upgrade their skills and are being encouraged to set up tiny production units. In the following paragraphs, an attempt is made to analyse a skill development programme envisaged to impart short duration training in leather goods (due to higher market price leather has been substituted by rexine and canvas material) to urban poor women in the Twin cities of Hyderabad-Secunderabad, the Provincial capital city of Andhra Pradesh, India.

3. The Small Industries Service Institute of the Ministry of Industry, Government of India, Hyderabad is involved in skill upgradation of the rural and urban artisans in the State in trades like leather goods, carpentry, scientific glass equipment making, steel furniture, soaps and detergents making, screen printing, phenyle formulations, candle making, scented hair oils making and a host of other trades. To impart such skill training, the Institute has three Mobile Workshop Vans, besides other facilities, which are moved to places where the training is to be imparted along with the master trainers. Duration of the trainings range from two weeks to fourteen weeks depending on the trade and the training requirements of the beneficiaries. In most of the training programmes Non-Governmental Organisations are being encouraged to mobilise the beneficiaries, to effectively supervise the training programmes, to coordinate with various Government Departments and Financial Institutions connected with the training programmes and setting up of small production units and also to help sale of the produced items. The women identified to receive such trainings are mostly persons with lesser educational qualifications, who otherwise have limited or no opportunities to secure wage employment in the organised or unorganised sectors, but are willing to utilise their leisure time for a productive activity. In all such programmes preference is given to those whose per capita family income is relatively lower. Usually a group of about 25 persons are selected at a time and each person is granted a monthly stipend of Rs.100 to meet incidentals. Raw materials worth Rs.6500 required for the entire group of 25 persons for the entire period of training are supplied by Government Departments at the local level, that is, the District Rural Development Agencies, District Offices of the Scheduled Caste Finance Corporation and at times the Voluntary Organisations sponsoring the programme. After completion of the training, individuals are being encouraged to set up small production units to be located either in their homes or in a central place in their respective localities.

4. The Training Programme for improving the skills of two groups of urban poor women, one located in the southern part of Hyderabad City and the other located in the northern part of the city, have been identified to elicit information about the progress made after receiving training. The group identified in the northern part of the city at Kushaiguda received about 14 weeks training and they have already established their small production units in their homes. Each individual was given assistance of Rs.5064/- for purchase of a heavy duty machine which can be used for stitching of leather, canvas and, rexine goods. The State Bank of Hyderabad and Andhra Pradesh State Scheduled Castes Cooperative Finance Corporation have totally financed the production units without any contribution from the promoters. All the beneficiaries have been working in their respective homes since August 1989 for producing various items like school bags, cash bags, school belts, bicycle seat covers, air-bags, vanity bags and a variety of other items required by the customers in the city. The second group located at Jahanuma completed their training programme in the month of February, 1990 and is in the pro-

cess of acquiring loans from the Minority Finance Corporation for margin money and one of the Public Sector Banks for the balance amount of the loan. As a follow up measure to ascertain the status of the two groups of women trained, 22 out of 47 beneficiaries have been identified. Details regarding their educational qualification, previous experience in the trade, marital status, family size, training details, family employment and income, details of loans obtained, production details, marketing of the goods produced, problems confronted by the beneficiaries in obtaining loans and their future plans have been obtained. The benefits accrued after the training and after setting up of the production units are analysed below:

Marital and Educational Status:

5. Out of the 22 respondents, 9 women were married and have varying responsibilities like attending to cooking, house keeping, child rearing and other family responsibilities. All of them reported leisure time available and were in a position to utilise their leisure time to participate in income generating activity. Although 8 out of the 22 respondents were already trained by their respective voluntary organisations for a period of one year in tailoring and embroidery, all of them stated that such training has been marginally useful and they have not been able to utilise the skill due to competition from well established units in the city. Out of the 22 beneficiaries, 2 were illiterates, 8 had primary education, 9 studied upto secondary level and 2 studied upto higher secondary level, but all of them could acquire the skill satisfactorily.

Employment and Income:

6. Family size, number of working members in the family and per capita income of all the respondent families as on the date of investigation is detailed below:

Sl. No.	Range of family members	No.of working members	No.of families	Per capita income per month(in Rs.)
1.	2-5	1.5	8	252
2.	6-7	2.0	4	189
3.	8-10	2.0	10	92

7. For the entire group of 22 families, the average per capita income was Rs.168/-per month. Thus, all of them required income generating activity in order to supplement their family income. On an average, only 1.8 persons in all the 22 responding families have been employed in the organised as well as unorganised sectors and a large potential has been found in the responding families for supplementary occupations.

8. In the bigger size families responding, the average number of working members in the organised and unorganised sectors put together, accounted for only two and their average per capita income has been the lowest,that is, Rs.92/-per month making it extremely difficult to meet their daily requirement for survival. In the group where the number of family members were between 6 and 7 there were two working members only and others were school going children and dependent relatives. Since the family size has been relatively lower the per capita income of the middle group was nearly double compared to the bigger size families. Though this group do not suffer from grinding poverty, all the families expressed their desire to have additional incomes to meet expenditure on school going children and to support their dependent relatives. At serial No.1 where number of family members do not exceed five, although 1.5 persons have been employed, their per capita income has been Rs.252/-. But this group also expressed their desire to have additional incomes to have better clothing and better food.

9. After training, 15 out of 22 beneficiaries reported incremental income ranging between Rs.35 and Rs.500 per month. 10 out of the 22 beneficiaries had an income ranging between Rs.100 and Rs.500 per month and 5 of them had income below Rs.100/- per month. 7 of the beneficiaries reported Nil income during the month of investigation. Out of the 22 respondents, 10 of them have already established their production units and the others have been doing job works, mainly school uniforms on the machines supplied by their voluntary organisation.However, Nil income has been reported by those women who did not possess the machines and margin money to purchase raw-materials.

Production and Marketing

10. Those who have already obtained machines and margin money to start productive activity have all been working to produce school bags, cash bags, bicycle seat covers, travel goods et cetera. Out of 10 persons having machines, 7 have reported that they have been working for 2 to 3 hours in a day on an average. The items produced by them were also of satisfactory quality and some of them have been manufacturing items as per their customer's requirements.

11. The production units set up in the homes of beneficiaries had the initial advantage of selling various items produced in their respective urban localities. Many of their neighbours purchased those items directly from the production units as the prices were lower compared to the prices prevailing in the retail markets. However, six months after starting of their units, the local demand gradually came down and many of them reported that they have been attending to repair jobs only. But all the 10 women who started their production units have continued to utilise their skills with varying degrees of success. Seven of them reported sales during the month of investigation but all of them stated that the consumers visit the production units to buy the latter's requirements. Three out of the ten respondents reported Nil sales during the month of investigation and requested for marketing support from outside Agencies. Lack of adequate work load to the production units could be attributed to organisational deficiencies. Although the Kushaiguda group initially planned that their group leader would be involved to act as a Commission Agent for procuring bulk orders from Institutions and Wholesalers in the city and purchase the required raw-materials in bulk at economical prices, they deviated from their initial understanding and started working in their production units purely on an individual basis. Consequently, the group could not derive the expected advantages like procuring of raw/materials at economical prices and securing bulk orders from Institutions and Wholesalers. Besides, the group leader who was expected to work on a commi-

ssion basis and initially mobilised the women for training could not participate in the group activity. As a result, the individual production units suffered due to lack of orders since none worked on their behalf to go round the city markets to book bulk orders. Further more, the women beneficiaries, due to lack of individual mobility, remained passive and were only waiting for orders. In the Jahanuma group of women whose loans are yet to be sanctioned, some have been working on the machines owned by their voluntary organisation who also have been organising the sale of goods produced. They mainly produced school uniforms since they received one year training in ready made garments making. But all the 12 respondents belonging to the group who did not start their production units have organised a cooperative and propose to set up a cooperative venture with six machines in the begining to produce items like school bags, travel bags and other items of mass consumption. Accordingly, the 27 member group of women contributed Rs.200 each as membership fees along with a monthly contribution of Rs.10 per beneficiary. As on the date of investigation they accumulated an amount of Rs.6500 for the proposed production centre. They also have elected an Executive Committee to organise the Centres activities such as purchase of raw materials in bulk and procuring orders from bulk purchasers. Initially they propose to set up six individual production units under one roof with a project cost of Rs.8000 each which are expected to provide direct employment to 12 beneficiaries. Each beneficiary is expected to receive a monthly salary of Rs.450 besides an annual profit of Rs.10,740 per production unit.

Conclusions:----

From the experience of the two training programmes organised, the following conclusions could be arrived at:

1. The two groups of women with varying degrees of skill and educational background became skilled in a short period.
2. The skill training received by the beneficiaries has been quite useful compared to the skills they already possessed and all of them were keen to utilise their skill to realise additional income to supplement their family incomes.
3. Besides their family responsibilities, all the urban poor women had leisure time to participate in income generating activities and those who established their production units could work for 2 to 3 hours during the day.
4. Significant additional incomes could be realised when production units were set up.
5. After the skill training, women became aware of their potential and made efforts to save and contribute marginal amount of their family incomes with an expectation to realise additional income and employment.

Thus, short duration skill development programmes for urban poor women through Non-Governmental Organisations can bring about dramatic changes in the lives of the urban poor families. With a relatively smaller investment for setting up of tiny production units, the benefits are likely to be quite significant. Women with varying degrees of family responsibilities can make use of their leisure time for productive activity to augment their family incomes. Furthermore, low income countries, facing capital scarcity, can spread economic and social benefits to a greater number of families with a relatively low investment.

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Integration of NGO water project components

Jon Lane

1. INTRODUCTION

The current coverage of water and sanitation facilities in Nepal (approx. 30% for water, 3% for sanitation) is considerably below the average for Asia. There is a great demand from the people for water: they generally identify it as one of the highest priorities for the improvement of their lives. Although the Government of Nepal has formulated plans to increase coverage, it is severely hampered both by the weakness of the national economy and by the geographical constraints of working in the Himalayas. Therefore a concerted effort is needed from the non-government sector to supplement the Government's work, and the Government welcomes this in principle.

The non-government sector consists of several hundred NGOs, such as health organisations, youth clubs, social and religious groups. These are mostly small organisations, with few staff or financial resources. They do, however, have strong local roots and enthusiasm. They do not wish to be used merely for the motivational aspect of some other agency's projects, but to carry out their own water projects themselves.

Typically such projects are small gravity-flow or tubewell schemes covering populations of 100-5000 people. The project locations are often isolated and the beneficiaries poor (their typical annual income being below U.S.$100) and ill-educated. Their general living conditions, especially as regards health, hygiene and sanitation, are bad. In principle, the NGOs try to involve the people fully in the projects and to place ownership in their hands.

In order to undertake these projects successfully, the NGOs need financial assistance, technical support and coordination. The author has been working in Nepal for over three years for an organisation which aims to provide these inputs. One of the major conclusions of the work to date has been the importance of integrating all the different aspects of a project into a single clearly-defined whole. This paper examines why and how to carry out that integration, starting from a consideration of the common problems.

2. PROBLEMS OF NGO WATER PROJECTS IN NEPAL

Among the major problems commonly identified in NGO water projects in Nepal are:

Conceptual Problems

- The community, the NGO and the donor often have very different understandings of the overall aim of the projects. (Ironically, this is often caused by the high demand for water: projects are seen as providing water only, and the overall improvement of health and living conditions, of which water supply is only a part, is neither understood nor demanded).

- In deciding whether to launch a particular project, the community do not have a clear idea of how much work is involved on their part. They can be over-optimistic about their own abilities.

- The people have difficulty in judging the success of their water projects. Often this is judged only by the flow of water from the tap, and not by the potential benefits to health and living standards. (These benefits will generally only be achievable if the water supply has been well designed and built, if it functions reliably for a long time, if the people make good use of their water and if other hygiene practices, notably excreta disposal, improve to complement the water supply).

Technical Problems

- Projects are designed without consulting the people or properly studying the location (e.g. tapstands wrongly located, sources which dry up). Often projects are designed by staff who are not sufficiently trained or experienced.

- Project design is not aimed at minimising maintenance (e.g. stream crossings too weak, odd sizes of pipes and fittings, over-use of imported items, use of poor-quality materials).

- Construction supervision is bad, leading to poor standards of construction quality and hence more maintenance problems (e.g. unburied pipes, leaking tanks, low yielding tubewells).

Management Problems

- In projects with several different components, these are often the responsibility of different staff members who fail to coordinate their activities, due to weak overall management.

- Construction work is not properly finished, which is usually due to under-funding or to lack of mobilisation of the people rather than to technical failures.

- Projects are ineffectively maintained, due to lack of systematic management and fundraising structures in the community and lack of manpower training.

Educational Problems

- The people accept poor quality of construction work, because they do not know any better, never having seen good quality work in their area.

- The people do not know the importance of good construction and regular preventive maintenance. They also have a poor attitude towards their own primary role in maintenance.

- The users abuse the system, because they have not been taught how to use it properly.

- The water supply is not used to its full potential (e.g. personal and household washing not increased, low quantity of water used, water quality not maintained in the home).

- The potential benefits of improved water supply are negated by poor hygiene and sanitation practices of the people (e.g. open defaecation, contamination of food, lack of solid waste disposal).

3. BENEFITS OF INTEGRATION OF PROJECTS

Many of the problems mentioned above can be reduced or avoided by integration of the different project components. For clear understanding, it is helpful to list these components. They fall into two groups: component activities and component phases.

Component Activities

Water Supply
Sanitation
Health Education
Project Management
Maintenance

Component Phases

Planning
Design
Implementation
Operation
Evaluation

The project consists of all of the activities carried out at all of the phases. Integration of the project simply means the understanding and use of the inter-dependence of each component with every other component. In an integrated project, all the component activities and phases are considered together and their links with each other are utilised to achieve the overall aim.

Thus, a water project is not carried out in isolation, but always with sanitation and health components, properly managed and maintained. The sanitation interventions aim to break faeco-oral disease transmission paths, in conjunction with health education. Environmental hygiene measures help to improve living conditions and optimise the benefits of water supply. Health education raises personal awareness and understanding of the basic issues, and hence motivation for all aspects of the project to be successful. The users are more committed to putting money and effort into the construction

and maintenance of the project, because they understand both its technical nature and its potential benefits. The NGO's project management structure provides cohesion, efficiency, accountability and a sense of ownership.

The beneficial effect of the whole project is greater than the sum of the effects of its individual parts carried out in isolation.

4. METHODS TO ACHIEVE INTEGRATION

The following are some methods and principles that have been observed to contribute to successful integration of water projects:

- The NGO understands the benefits of the integration, as outlined above. This generally requires careful explanation, because the original demand from the people, and hence from the NGO, is usually for the water supply component only.

- The NGO always thinks of the project as a whole and not of the components in isolation.

- The people are educated before implementation starts to share the NGO's understanding of the nature of the project and to raise their enthusiasm for it.

- The project is carefully defined and planned as a whole, rather than planning each component in isolation. For example:

    - The health education work leads to the demand for sanitation improvements, so the latter is planned to start later.

    - If water is needed for the preferred type of latrine, then the water is planned for completion before the installation of the latrines.

- The individual component activities are then designed in detail and cross-referred to each other.

- A proper range of staff are appointed and budgets clearly allocated to each component, includng those less visible such as the project management and training.

- A maintenance committee is formed before construction starts, to motivate and inform the people about the maintenance while they are building the project.

- Tapstand user groups, formed primarily for fund-raising and routine maintenance, can be be used as focus groups for the health education work.

- Maintenance workers are appointed before the construction starts, and can be trained during construction.

- The education on use of the water is completed before the water flows, so that the people understand how to use it from the very beginning.

- During the implementation phase, the NGO and the project staff constantly monitor the work, view the progress of each activity in relation to the others, and identify problem areas. This information is fed back to the community, and activities can then be replanned to cope with the actual circumstances. For this, flexible timescales and budgets are necessary.

- During the operational phase, problems that occur with the water or sanitation system can be used as themes for the educational work.

- The evaluation of the project considers all the components together in the light of the stated aims and objectives. Lessons from the evaluation can be incorporated into the planning of future similar projects.

5. SUMMARY

This paper has drawn attention to one important aspect of NGO water projects in Nepal: that of integration of the project components. An integrated approach has many benefits in helping to solve the common problems found in such projects. Some indications have been given of working methods to achieve integration in practice. Although the paper is based on experience in Nepal, the ideas discussed may also be helpful to NGOs in other countries.

16th WEDC Conference

Infrastructure for low-income communities

Hyderabad, India 1990

Communications for community management of infrastructure

Wendy Quarry and Robert A Boydell

1. COMMUNITY MANAGEMENT OF INFRASTRUCTURE

From Community Participation to Community Management

Community management is not just a different way of talking about community participation. As we all know, community participation as a concept arose in the mid sixties but was not really adopted by the IDWSSD until the mid eighties when it became apparent that governments and donors could no longer afford totally centralized operation and maintenance systems for water and sanitation infrastructure. Planners began to realize that in order to share the responsibilities for maintenance, beneficiaries or users would have to be involved in some form or other in the on-going maintenance of their own community systems.

Although there was an implicit understanding that beneficiaries would have to change their role from that of totally passive receiver, there was no vision that central agencies and donors might also have to change their approach to implementation in order to facilitate this process. The initial design of projects basically remained the same with emphasis on the 'top-down' hardware approach provided by the central agencies. This was supplemented by separate communication components intended to facilitate the community's involvement in taking on some responsibility (keep the pad clean, preventive caretaking, etc.) for maintenance after the systems had been installed.

Not surprisingly, this middle of the road approach has not always proved to be successful. It is now realized that in order for the community to take on responsibility for maintenance it must also be involved in the planning and implementation of the project right from the initial stages, to develop a sense of 'ownership' for the system and an ensuring understanding that if a system is to be maintained, it is the community's responsibility to do so.

This paper examines the concept of community management and the role that communications must play in facilitating that process. It first looks at communications in the development process, discusses its present role in the water and sanitation sector and finally outlines an approach to developing a communication strategy for community management.

From Beneficiary to Client to Manager

Community management implies that the community does more than contribute labour or small inputs into the planning process but emphasizes the community's decision making power over water inputs and the role it must play in maintaining and paying for these inputs after they have been installed. This implies a completely different role for the central water agency and a change of role for the community:

> The community must change from that of passive receiver to informed consumer/client/manager capable of making choices as to what type of service level they themselves will have the capacity to service and pay for. The community must also acquire management and organization skill with leadership capable of defining tasks and carrying out the management function to do this.
>
> The central water agency must change from benefactor that makes all the decisions to that of facilitator enabling the community to make their own decisions and must learn to be responsive to consumer/client demands. It must become accountable to the community.

In a recent project proposal for demonstrating the 'community management' approach in India, the donor agency reading the proposal sent back a query. How, they wanted to know, in a project that is still said to be implemented by a government agency, can we ensure that the community itself makes the major choices and takes the important initiatives?

This is the key question. How can we use communications to facilitate this change of behaviour and how do we do it at both the community and government/water agency level?

2. THE ROLE OF COMMUNICATIONS IN THE DEVELOPMENT PROCESS

Development Communications

If we see communication as the imparting or exchange of information, we can see that development communication could be said to be the process that makes use of communication tools to facilitate a person/community's access to information to enable the person/community take on responsibility for some of its development needs. Communication thus plays a role by providing a complex listening/interpreting mechanism to help the person/community identify needs and finally interpret those needs to the planners. Conversely it can assist the planners in presenting their views and ideas back to the community.

> In Mirzapur district, north of Dhaka in Bangladesh, video was used to record a focus group discussion amongst village leaders discussing the community's problems around the sharing of handpumps, the need for ongoing maintenance and their desire to have male members included in the caretaker training program. This video was then taken back to Dhaka, reviewed by project organizers who changed their thinking re caretaker training. There was nothing the project team could do however about the problem of pump sharing (who should pay for the repairs, etc.), the community had to work that out for themselves through a further internal process of group meeting and individual discussion.

Communications in Water and Sanitation Sector

A look at the overall present day role for communications in the water and sanitation sector in the region however, shows that more often than not, communications tends to not be viewed so much as a facilitative process to empower a community to take on its own responsibilities for water and sanitation, but as a product that can be used, or a tool to instruct communities into a pattern of behaviour (read hygiene education) previously defined by the project planners (pay for on-going maintenance, wash your hands, etc.). Consequently communication inputs are measured in a product oriented manner (the number of messages delivered or the number of posters/manuals that have been produced to facilitate this delivery of messages) when what should be evaluated is the community's capacity to organize its own requirements for water and sanitation inputs and government's role in facilitating this process.

Why is this so important? The overall goal of a water and sanitation project is to improve the general state of health and environment of a given group of people in order to increase their subsequent economic activity. We are not looking at access to safe water alone but at increases in health and economic productivity as a result of people making use of safe water and environmental sanitation practices.[1] This implies the need to introduce a set of new ideas, new practices and, in the case of community management, new responsibilities that must be undertaken by this group of people both collectively and individually. This presupposes the need for sustained behavioural change.

Studies have repeatedly shown that people are more ready to change their behaviour on a more permanent basis if they are given the chance to be involved at a decision making level in making these changes for themselves and for their community. Moreover, while the "delivery of messages" approach to behavioural change has a fair degree of success in the West (campaigns to reduce smoking, reduced fat intake in diet, lower cholesterol, etc.) where the population has already accepted the premise that it is the responsibility of the individual to take control over his/her own health needs and where a high degree of education makes this possible, it is not applicable to low income countries where people do not feel they can do anything to change their own lives nor have the sense that the government can and should actually support them.

3. THE COMMUNICATION STRATEGY FOR COMMUNITY MANAGEMENT

In planning a communication strategy for community management, communication cannot be seen as a separate component, communication is the underpinning for the peojct, or in another way, communication is the project.[2]

There are basically two levels of communication inputs needed for developing a communication strategy: the need to design communication strategies for facilitating a change of behaviour at the central agency level (to change from implementer to facilitator) and the need for facilitating behavioural change at the community level.

Central Level

Not a great deal of attention has yet been paid to developing explicit communication strategies for assisting policy makers and central government agencies in the process of changing their role from providers to facilitators. Certainly conferences such as this and international forae add to the process. The idea of holding participatory workshops involving all implementing agencies to work out shared, overriding goals for the project is a strategy put forward by PROWWESS and one that will be implemented in India through the RWSG-SA upcoming Community Management Demonstration Project. RWSG-SA also plans to produce a handout in easily readable and visual form outlining the project goals and strategies and explaining the communication strategy for facilitating community management.

Community Level

Quite recently more thought has been given to developing communication strategies for community involvement in project planning, implementation and management. Although, of course, there is no such possibility as a blueprint for action, there are certain guidelines for project planners that could be established: For example, it is essential to identify the cadre of people, particularly women, trained in communication/participatory/ adult education skills who will be responsible for creating the interface between the project facilitators and the community. This unit could either be set up within the facilitating agency (e.g. communication cells set up within PHED in 7 states in India), attached to the agency (Socio-Economic Unit in Kerala) another government institution or NGO. The unit must also have adequate budgetary and administrative support including transportation. It is very important that the unit have a degree of decision making power within the project and with the other facilitating agencies.

The role of this unit will be to liaise with the community through participatory individual and group meetings to: discuss with them the possibilities of improved water and sanitation systems and seek their participation in working with the government to provide these services, assess with them their needs and identify together through shared baseline data collection and the type of village mapping discussed in Mr Boydell's paper etc. their technical requirements and abilities to pay for differing levels of service, train and assist them in decision making vis a vis technical requirements, build capacity in terms of assisting in the formation of water committees, book keeping, hygiene education and caretaker training. In many countries it will be essential to form separate women's communication groups to ensure their participation.

This is the process of capacity building towards management that the implementing agencies must facilitate. The role of facilitator is not as straightforward as that of provider but it can be done, is being done in pockets throughout the region. In the long run, there is no other way.

PROWWESS: Promotion of the Role of Women in Water and Environmental Sanitation Services. (a UNDP interregional project).

RWSG-SA: Regional Water & Sanitation Group-South Asia, the World Bank.

PHED: Public Health Engineering Department

1. From a paper called "Community Participation in Rural Water Supply Program: Some Issues". R GOPALAKRISHNAN, Humphrey Fellowship.

2. CHATTERJEE, Ashoke, Communication Consultant, Department of Rural Development, Government of India.

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PLENARY SESSION 1
Communities, women and NGOs

Discussion on Papers

COMMUNITIES, WOMEN AND NGOs

Chairperson:
Justice K. Amareshwari

Co-chairperson:
Prof. J. Pickford,
WEDC, Loughborough University of Technology

Papers presented:

F S BEGUM
Women in infrastructure: Bangladesh experience.

V FERNANDO
Women's participation strengthens NGO projects.

B A HOQUE, K M A AZIZ, Kh ZAHID HASAN & M Y PATWARY
Rural women in sanitation programmes.

K P RAO
Skill development for poor urban women.

J LANE
Integration of NGO water project components.

W QUARRY & R A BOYDELL
Communications for community management of infrastructure.

DISCUSSION

F S BEGUM

1. Ms DAW (National Association of Water Resources Development Agencies, Pune) asked what wages were paid to the women labourers; and whether they were comparable to those paid to men for doing the same work.

2. Mrs BEGUM replied that, under the terms of the contract, the same wage rates were fixed for men and women doing the same type of work. It was, however, found that the output from women was less than that from men, so that the women took longer to complete given tasks. When final wages were calculated, there was therefore a difference between the average wages paid to men and women. RESP is now considering the possibility of fixing a different rate for work done by women.

Under World Food Programme terms, women receive more wheat than do men for doing the same amount of work. This is on condition that all work for a scheme is completed exclusively by either men or women. Women and men receive the same wages if men and women work together in the same food for work scheme.

B A HOQUE, K M A AZIZ, Kh ZAHID HASAN & M Y PATWARY

3. Ms RAHMAN (Orangi Pilot Project Research and Training Institute, Karachi) commented that originally the community were expected to pay 30% of the cost of pit latrines, but that later the entire costs were met because they were too high for the community. (i.e. the latrines were provided free to the community.) Ms RAHMAN stated that in her experience of working with NGOs in Karachi any rush for results stops further expansion; and asked the authors whether the expansion of the project had been such that it was not copied by the community.

4. In reply, Ms HOQUE agreed that these observations were familiar. Some projects are not developmental, but aim to keep to targets and to achieve quick results. The case study described was an experiment, not a development project. On reflection, the system cost was high. It may have been designed without adequate attention to the affordability aspect. A complete change in design was really needed. Providing the latrines at no charge to the community was an easy, but not the best, solution.

5. Dr DAS (UNICEF, Calcutta) noted that 65% of the pits had been emptied by women, and wished to know how the remaining 35% had been emptied.

6. Ms HOQUE explained that 35% of the pits were cleared by men at the same wage rates paid to women. Some people emptied their own pits and those of other families at a cost of only 20% of that charged by professional pit-emptiers.

7. Ms DAW (National Association of Water Resources Development Agencies, Pune) enquired about the Health Education input to the project.

8. Ms HOQUE replied by stating that the health education messages were changed from time to time.

9. Ms DAW then asked about the policy adopted for emptying the latrines because hiring professionals was considered expensive. Ms DAW wondered whether the agency decided to use women to empty the pits because it was the cheaper option, or whether the women were paid at rates comparable to those charged by professional pit-emptiers.

10. In answering this question Ms HOQUE expanded on a reply given to a similar question, stating that local people were paid to desludge the pits because they were willing to do the work at one-fifth of the rates charged by professional pit-emptiers. The adopted method was the cheaper option, because some people were willing to empty their own pits and to be paid to empty those of other families.

11. Mr MATHUR (UNICEF, New Delhi) asked for confirmation of these details. He noted that it had been stated that the women and men cleaned pits at one-fifth of the cost for the work to be done by professional cleaners, and asked whether the people concerned cleaned only the pits in their own houses, or whether they also cleaned pits in other homes.

12. Ms HOQUE confirmed that some people and been willing to empty pits in houses other than their own.

K P RAO

13. Dr DAS (UNICEF, Calcutta) noted that the title of the paper referred to skills development for poor urban women, and enquired about any experience that the author had regarding skills development for poor rural women.

14. In reply, Mr RAO stated that training had been given to both urban and rural women without differentiation. The case study and evaluation which were detailed in the paper applied only to the urban women.

15. In a subsequent written comment, Dr DAS stated that he was not fully satisfied with the answer given. Skills development in poor rural women differs considerably from that in urban women. This is because of the agricultural bias, raw material availability, productivity and scope for marketing which apply to rural women.

J LANE

16. Dr MAHAPATRA (UNICEF, New Delhi) asked what steps had been taken to wean communities off NGO-supported projects and to be more self-reliant. If such action had been initiated in any areas, Dr MAHAPATRA enquired whether the communities continued to depend on NGOs.

17. Mr LANE recognised the importance of this question, but explained that it could not be fully or adequately answered in brief. From the beginning of a project, the NGO tries to involve the community fully in decision-making and (especially) establishing local management structures. These groups and committees will continue to function after NGO support has ended.

18. Ms KATTICAREN (Netherlands Assisted Projects Office, Hyderabad) referred to the strategies and approaches described in the paper. She asked whether such methods could be used in bilateral aid projects having established systems and rigid financial allocations.

19. In answering this, Mr LANE stated that the flexible, integrated approach should be possible for any type of agency: local, bilateral or multi-lateral. Finances should ideally be allocated for all components at the start of the planning process. If this has not been done, the possibility for re-allocating resources during the project depends on both the organisation itself, and the flexibility of its internal procedures.

20. In a written question, Dr MANI (Progress, Hyderabad) asked whether any NGO had sought funds from WaterAid for traditional water supply and sanitation projects such as water divining, water harvesting, water recycling, traditional medication and disposal of water. If so, Dr MANI wondered whether the integrated management programme outlined may provide useful comparisons between the suitability and relevance of traditional and existing technologies at the village level, where resources are poor.

21. Mr LANE confirmed that WaterAid supports some projects which include elements of traditional water usage. WaterAid considers it important to respect and observe the traditional practices, and to incorporate those that are relevant into project planning. The integrated approach is well-suited to incorporating traditional, social and technical ideas, because it places emphasis on the ability of the community to manage their own affairs and on their flexibility of response.

W QUARRY & R A BOYDELL

22. Ms KATTICAREN (Netherlands Assisted Projects Office, Hyderabad) commented that it was good to hear of an organisation such as the World Bank accepting and adopting new ideas and approaches from the grass-roots. Such a policy should help the World Bank to change its strategies for funding projects, instead of having to impose their desires on implementing agencies.

23. Dr MAHAPATRA (UNICEF, New Delhi) commented that communication strategy planning or implementation, ultimately through the government system, should achieve the desired goal; but that this cannot come just by having communication cells in PHEDs (Public Health Engineering Departments). Communication inputs need to be institutionalized at the lowest levels, and also by developing internal and external communications between existing government channels at all levels. Strategies have been tried, and are working, using sanitation cells in a programme in Rajasthan.

24. Ms QUARRY agreed that simply putting a communication cell in the PHED is not enough; adding that this only suggests how some organisations are making a start. The paper did not emphasise that the importance of such cells should be equal to, or greater than, technical inputs. It is known from experience that communication cells or socio-economic units tend, at present, to be like Siberia (unpleasant places of exile) for the engineers assigned to them. Another option would be to concentrate implementation through another government agency; such as community development or local government. The field workers in such agencies would create the interface with the communities and liaise with the technical inputs from PHED.

25. Dr MANI (Progress, Hyderabad) asked for details of a suggested two-way communication system that would help in the decision-making process.

26. Ms QUARRY, in a written answer, suggested the scheme illustrated, if it can function at the decision-making level. There may be problems in implementing the scheme shown, and different combinations could be attempted. This is a two-way communication system considering the interests of each villager.

Technologists, NGOs, Academics, Political bodies, Bureacrats.

Village level body represented by teacher/ health worker, women, village elders, youth

State level system represented by a few villagers, women, NGOs, and state administration

District level, represented by a few clusters, NGOs, women and youth groups

Cluster of villages represented by a few villagers, women youth village heads

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Mrs BEGUM
Dr DAS (UNICEF, Calcutta)
Ms DAW (National Association of Water Resources Development Agencies, Pune)
Ms HOQUE
Ms KATTICAREN (Netherlands Assisted Projects Office, Hyderabad)
Mr LANE
Dr MAHAPATRA (UNICEF, New Delhi)
Dr MANI (Progress, Hyderabad)
Mr MATHUR (UNICEF, New Delhi)
Ms QUARRY
Ms RAHMAN (Orangi Pilot Project Research and Training Institute, Karachi)
Mr RAO

PLENARY SESSION 2:
Urban infrastructure

16th WEDC Conference
Infrastructure for low-income communities
Hyderabad, India 1990

Optimizing infrastructure

Dr A P Cotton and R W A Franceys

Conventional physical infrastructure for urban low-income housing is extremely expensive in relation to income levels. Based on information contained in the 1989 World Development Report of the World Bank, $140 per year per household is a generous estimate of what the urban poor can afford to pay for both housing and services.

The tendency in many low income housing schemes, especially of the 'sites and services' type, has been to ignore the wide range of service options which are available and to use 'conventional' service levels in the region of $130 per household per year; to this must be added the actual housing cost of perhaps $100 per year. Subsidies are thus required from municipalities and other relevant agencies who can ill-afford to pay for operation and maintenance in the long term.

It is a gross over-simplification to regard infrastructure cost merely as a function of 'service length' in relation to site layout; the wide range of options within each sector have significantly different capital and maintenance costs in their own right. Infrastructure requires land reservation and there is therefore an associated land cost. When the land cost is high, overall costs may be minimised by selecting a technology which has a high construction cost but which requires the minimum land-take. There are also significant technical interactions between different technologies which have operational and financial implications.

RESEARCH PROJECT

To investigate these issues the authors have recently completed a research project which had as its aims:

1. To determine the range of technical options available within each infrastructure sector.

2. To explore means and appropriate sequences by which infrastructure can be upgraded over a period of time.

3. To explore the interactions between available technical options and their implications on the strategic planning of low income housing schemes.

4. To investigate the effect of upgrading infrastructure on the life-cycle costs through the development of 'sector cost models' using standard spread sheet programs on PC microcomputer.

The research methodology has been to assemble a range of servicing options based on different technologies available within each infrastructure sector and then to calculate the capital, operation and maintenance costs of each servicing option using baseline costs from the Far East (Philippines), Africa (Lesotho) and India.

Total Annual Cost per Household' or TACH is used as a cost indicator. The TACH is obtained by amortizing the present value life cycle cost over twenty years using a discount rate of 5%. The low discount rate is used to prevent replacement costs and future maintenance costs being rendered unimportant by the mechanics of the discounting procedure. TACH can easily be related to household income and therefore provides a relatively simple means of investigating the affordability of the different servicing options.

A vast number of permutations of different servicing options can be assembled from the technologies identified; a total of 31 different options were studied. In addition, each of these options was tested against the variables:

- -plot size (30 to 500 square metres in six steps)
- -plot shape (frontage-to-depth ratio between 1:1 and 1:4)
- -site layout (rectilinear cluster or linear layout)
- -land cost (US $0.5-$10 per square metre)

In order to assist in the data processing, a microcomputer model using the spreadsheet LOTUS 123 was developed. The model incorporates facilities both for design and upgrading of services with lifecycle costs and TACH calculated for a specified servicing option using predetermined dimensions and unit costs. The model comprises six independent modules:

- -site layout
- -roads and access
- -sanitation
- -water supply
- -storm and sullage drainage
- -power supply

The site layout module is used first to determine the land required for access for a wide range of access types; the roads and access module calculates the TACH having made decisions about the replacement values which depend upon the upgrading sequence specified by the user; the drainage module uses the 'rational method' of storm drainage design to calculate runoff, and the Manning equation to size the drains, relevant catchment data must be input by the user; the water supply module matches the demand requirements to the sanitation system which is specified, appropriate pipe diameters are calculated; the sanitation module calculates the required sewer size (if required) for that option; the power supply module calculates system costs including ancillary equipment such as transformers for both overhead line and underground cable systems.

PROJECT RESULTS

The choice of technology affects and is affected by many factors, including plot size and housing density, site layout and access requirements. Many of the technical options available for infrastructure have minimum access requirements for both construction and maintenance of the services provided. If the site infrastructure is to be upgraded over a period of time, it is vital that the access provided does not in any way restrict the future development of the site. For example, land reservation for an eventual power supply must be included in the initial site planning even if the supply is not to be provided in the first instance.

There are many interactions relating to technological compatibility. The choice of a particular technology in one sector may place restrictions on what is appropriate within another sector. For example, if on-plot latrines are chosen for sanitation, careful consideration must be given to sullage disposal. In turn, sullage disposal technology interacts with plot size; if large plots (>100 m^2) are in use, on-plot soak pits can be used, otherwise other disposal means must be used.

Interactions have an important effect on the cost of infrastructure. For example, if sewerage is used as a means of sanitation, a high level of water supply service involving individual house connections is also required which further increases the cost.

The cost of various servicing options for rectilinear cluster and linear layouts was investigated. The cost is a function of the physical size of the site and we have therefore restricted the analysis to a group of 40 plots in an idealised cluster.

The analysis is based on the actual values of TACH; the problems of 'who pays' and ease of cost recovery are outside the scope of this paper.

Four typical servicing options were investigated; option 1 represents a typical 'conventional' high level of service. Figure 1 shows the variation in TACH with plot size for different service options using the Far East case study data. Savings of between 40%-60% can be achieved by using more appropriate lower service levels such as options 2 & 4; Figures 2 & 3 show the results for the Africa and India case study data. The data shown is for low land cost; whilst increasing the land cost causes the TACH to increase, the principles of the interpretation which follows remain unaffected.

Such major potential cost reductions are of great significance and it is important to attempt to separate out the effects of the various infrastructure components to see which are the most significant. The bar charts shown in Figure 4 summarise the potential cost reduction which can be achieved through the selection of appropriate technology in each infrastructure sector over the full range of plot size, layout, plot ratio and land cost.

The choice of sanitation technology has the greatest potential to reduce costs; savings in the range 30% to 50% of the total servicing cost are possible through the choice of on-plot pit latrines as opposed to sewerage. The sewered option includes a cost for appropriate sewage treatment using waste stabilization ponds. In addition, household connections for water supply are necessary in order that the sewerage system functions adequately and this adds significantly to the TACH.

Significant but lesser savings have been identified through:

- Limiting the access width within the cluster or street from 5 metres down to 2.5 metres; note that for 500 m^2 plots, only 5 metres access was considered and therefore the percentage cost reductions shown refer to the 250 m^2 plot size rather than 500 m^2; this is more important at higher land cost and large plot size.

- Using the 'road as drain' option which reduces both the service land required and the construction cost.

- Investigating cheaper road construction such as profiled earth or gravel or local paving stone; this will lead to concomitant reductions in drainage cost.

The alternatives for solid waste disposal and power supply seemed to have little effect.

The layout has an important effect on service cost; in general, the linear layout is between 17%-26% cheaper than the rectilinear cluster over the full range of servicing options, plot size and land cost.

The plot ratio can also significantly affect servicing cost; the cost difference ranged from 5%-33% with square plots being more costly to service than plots having a short frontage compared with their depth. In addition:

-low cost servicing options are less sensitive to plot ratio;

-cluster servicing costs are less sensitive than linear layouts to plot ratio;

-servicing costs for small plots are less sensitive to plot ratio than are large plots;

-high land cost results in a greater sensitivity to plot ratio.

For minimum sized plots using the cheapest servicing option, the effect of plot ratio on servicing cost is not significant, giving only about 5% difference. This is a useful finding in relation to upgrading schemes on a small, irregular shaped sites where plot shapes and layout may have to be irregular.

The authors believe the research findings to be unique in respect of the range of variables investigated and in the quantitative substantiation of many issues which have in the past only been referred to in a qualitative way. The potential impact of the findings upon infrastructure costs for urban low income housing is enormous.

CONCLUSION - priority tasks for follow-up

The personal computer based spreadsheet models prepared for use in the research are an efficient method of analysing all the variables associated with services. Because they can be readily programmed to accept specific data relevant to any particular location they could be used in engineers

and planners offices in many countries to optimise services provision.

The most significant factor in infrastructure provision distinguished by the lifecycle cost model is sanitation.With the large savings to be made from using on-plot technologies as opposed to sewerage there is an urgent need to investigate more fully the potential for using improved latrines on small plots. The technology of on-plot sanitation is well understood and accepted in rural areas and for large plots(400 m^2 to 500 m^2) in urban areas. However, this research has proved that there are significant savings to be made by using on-plot sanitation on plot sizes as small as 30 m^2 to 50 m^2 (as has already been demonstrated in India).

Areas to investigate include the environmental pollution risks of a high density of on-plot latrines, For an improved ventilated latrine there is a need to investigate vent pipe heights in built up urban areas, which can result in wind shadowing and failure of the odour and fly control mechanism.

The second priority for savings is related to drainage. One of the methods identified to improve drainage at reduced cost is the construction of a 'road-as-drain'. Examples have been noted, primarily in India, but no research has yet been carried out to prove the concept to a point where it can be promoted with confidence in other parts of the world.

With regard to the management of services provision on low income housing sites it has become apparent that the conventional municipal council approach often cannot satisfy the demand for regular repair and maintenance.

Whereas previously the boundary between 'private' and 'public' goods has been the house plot boundary, our research suggests that this could be moved out to a 'local area' boundary with the municipality responsible only for bulk transmission and bulk disposal. Further research is required to investigate the legislative framework, the municipal regulations and the bylaws necessary to support this approach.

Acknowledgement

The infrastructure study upon which this paper is based was carried out on behalf of the Overseas Development Administration (Project No 4404) whose support is gratefully acknowledged.

Servicing options

	Option 1	Option 2	Option 3	Option 4
Access width	5m	2.5m	255m	2.5m
Storm drains	Lined	Road-as-drain	Road-as-drain	Road-as-drain
Sanitation	Sewerage	Pit latrine	Sewerage	Pit latrine
Water supply	House connections	Public standpost	House connections	Public standpost
Sullage disposal	Sewerage	Lined sullage drain	Sewerage	Lined sullage drain to rear
Roads	Sealed surface Paved to rear	Paved	Paved	Sealed surface Paved to rear
Power	Overhead lines	Overhead lines	Overhead lines	Overhead lines

(* except for plot sizes > 100m^2 where soakpits were used)

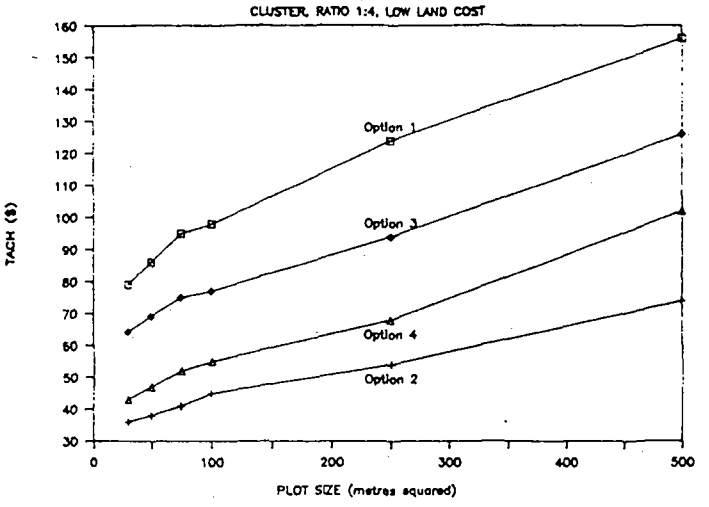

Figure 1. Service Option Cost, Far East

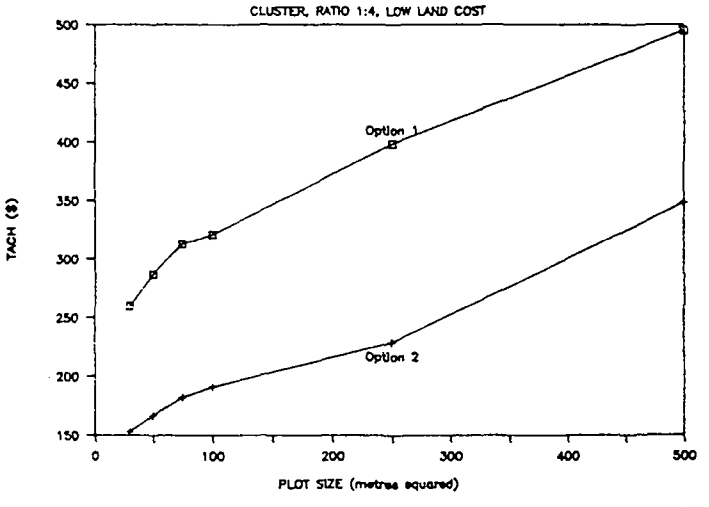

Figure 2. Service Option Cost, Africa

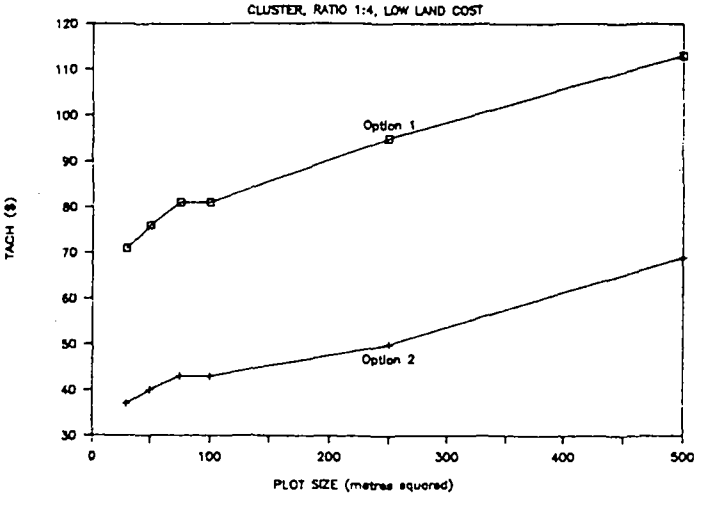

Figure 3. Service Option Costs, India

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Hyderabad, India 1990

Women and solid wastes in poor communities

Dr Christine Furedy

RESOURCE SCARCITY, WOMEN, AND SOLID WASTE MANAGEMENT

The subject of the use of waste materials by women to meet basic needs and generate income and work may seem to have no relevance to "infrastructure." The justification for addressing this topic is that solid waste management (SWM) is one of the essential services that any healthy community must have. To plan sustainable and equitable SWM in developing countries requires not only a knowledge of the nature of wastes generated by households, enterprises and businesses, but also an understanding of how wastes are used in communities, and what livelihoods are based on wastes. This is important because waste reduction and recycling are coming to be recognized as the basic premises of all waste management.

Equipment and procedures designed without any regard for waste recovery and recycling in resource-scarce societies rarely achieve their goals because those who depend upon wastes continue to try to gain access to them, thwarting, in the process, the plans of municipal managers. Despite this evidence of the needs of poor communities, municipal or corporate sector recycling schemes are sometimes suggested that would divert wastes from current users without assuring them access to substitute resources. These miscalculations occur partly because informal waste recovery is not seen to be relevant for the planning of basic services.

Because poor people extensively exploit wastes as resources, there are special relationships between waste management services, household management, and work which may not pertain to other dimensions of infrastructure. Since women in most societies tend to have initial control over the generation and reuse of wastes in the household, it is relevant to ask whether there are, within the "special relationships" of poor people to wastes, further distinctive aspects of women's work that warrant particular, even separate, attention. The practical issue for meeting basic needs is whether solid waste management (and environmental management in general) will be more successful if planners incorporate the findings of research on "women and wastes."

The work of urban women with waste materials is relevant for cities' economies and services in three principal areas: the use of wastes to meet household needs, informal work in waste recovery and recycling, and women's roles in municipal solid waste services (ref. 1).

WASTES AND HOUSEHOLD NEEDS

The use of wastes by poor households to meet basic needs is observed in all developing countries, although there is not even in a single case-study to provide a sense of how important wastes can be in household management. The use of wastes for fuel, particularly animal dung and agricultural residues, including urban vegetable wastes, such as coconut husks and shells, has been estimated in a number of areas (ref. 2). Waste burning especially of cattle dung, is a routine matter for poor families of squatters and pavement dwellers in India. Another use of dung is also common in the Indian sub-continent--the preparation of floors and sometimes walls with dung wash. Women, as the providers and organisers of daily household needs, are responsible for marshalling these waste products, although they may often rely on their children to gather dung or other wastes.

Prior to the building of a shelter, women may play the major part in assembling the materials for a squatter's shack. They keep a look-out for items such as strong plastic, scrap iron, lumber, broken bricks, and rags that can be used to repair their shelters, repairs that they will make as routine housekeeping. One can hypothesize that the shorter a poor urban family is of ready cash, the more the women and children of the household must seek out wastes and resort to conservation and reuse as strategies (ref. 3). This search for wastes frequently takes women and children beyond their immediate neighbourhood (for poor communities are not generators of large amounts of useful wastes) to the waste receptacles of rich districts, commercial areas, and, ultimately, to garbage dumps (ref. 4).

In these circumstances, the daily work of poor urban women becomes closely linked to the availability of various waste materials. When these apparently trivial activities are multiplied by the millions of very poor households in cities and towns in developing countries, daily living can be seen as significantly waste-absorbing. At the same time, one can understand the importance that access to wastes assumes for low-income families.

INFORMAL WORK BASED ON WASTE RECOVERY AND RECYCLING

In most cities of developing countries, waste gathering extends beyond household needs as people find employment supplying the demand of small and large industries for wastes--paper, plastics, metals, rags, rubber, leather, glass and ceramics, bones--as substitutes for raw materials. Each large city manifests an intricate network of waste gathering, dealing and transportation--waste pickers and itinerant "announced" collectors, sorters and processors, buyers, dealers, and manufacturers. In South Asia some of these roles remain linked to traditional socio-religious statuses.

Although local systems usually have distinctive characteristics, the main status lines in waste recovery are uniform in developing countries: women and children predominate in the lowest levels of waste gathering, that is, those that depend on the least valuable wastes whose retrieval demands the greatest amount of simple labour for the lowest cash returns. Thus on dump sites that receive largely organic and inert rubbish in Asia one finds mainly women and children, except at times when men know that trucks will arrive from special areas such as the airport or certain commercial and residential neighbourhoods.

At Calcutta's Dhapa dump, for instance, most of the material retrieved consists of coconut shells, coal cinders, and pieces of wood. Besides pieces of glass, the manufactured wastes are very damaged and dirty fragments of paper, plastic, cloth, and leather. Unless they know that better materials are likely to be available, men resort to such a dump only if they can find no other kind of work at all. Casual observation suggests that cities where more valuable materials reach dumps in large quantities have larger numbers of male pickers. [It is possible that religious values may influence male/female ratios among dump and street pickers; in Muslim societies women may not venture readily onto so public a place as a large garbage dump. In Indonesia, more women are absorbed in sorting, packaging and simple processing of wastes than in collecting for industrial trading (ref. 5)].

The traders and managers of the waste recycling industries are, by all accounts, men. Women and children usually receive less for the wastes they sell and they find it harder to get advances or loans from buyers for equipment to reduce the burden of waste gathering. In South Asia women do not take the role of itinerant collectors who go from household to household, receiving, buying or bartering wastes. It must be extremely rare for a woman to "rise up" in a system of waste trading, unless she is part of a successful family business. I know of no instances of women acting as dealers or running independent waste trading enterprises.

How do these household strategies and informal work relate to the nature of solid waste services?

The substitution of wastes for purchased materials, even if the wastes are not entirely free, represents important savings for poor households, and resource conservation for the society as a whole. This extensive waste recovery, incidentally, reduces the amounts of wastes that cities have to collect, saves dump space, and allows the residues to break down into productive compost (ref. 6). Few municipal managers, however, see informal waste recycling in this light, and there has been very little discussion of ways to facilitate waste recovery by the needy (ref. 7). Most changes in equipment and techniques are explicitly designed to prevent or discourage scavenging of recyclables. The result of the introduction of large, lidded, containers (especially roll-on-roll off containers) is that recyclables are not retrieved in neighbourhoods, but are transported to dump sites (ref. 8). This means that less material is locally available for household needs; poor people are thus compelled to either purchase wastes from traders, or seek out waste transfer points and dump sites.

WOMEN MUNICIPAL WASTE WORKERS

The lowest jobs of the municipal cleaning system may be practically reserved for women in some countries, and they are rarely, if ever, promoted. In some countries of South America, women street cleaners are routinely subject to sexual abuse, but no explicit reference has been found to this in Asian cities. In some Indian cities, where municipal workers are given assisted housing, on the death of her husband, a widow immediately seeks work in the municipal corporation, and is usually regarded as having a right to the first cleaning job available, because, if she does

families seek to place children and grandchildren in the municipal labour force. Thus the need for housing compels these children, who might have the chance of better work, to continue in the job of the father or mother. The working conditions for women sweepers are often very poor--they may have no footwear or gloves, no adequate implements for sweeping and waste collection. But fear of losing the valued municipal job, among other things, means few complain about the situation, or request child care services and maternity leave. This menial work, however, gives these workers an insight into waste behaviours that could be valuable to municipal planners.

RESEARCH AND COMMUNITY ACTION

A number of ideas for research arise from this perspective on women and wastes, enquiries that can help community action and official policies for environmental improvement.

1. Household economy studies to estimate the importance of wastes in meeting basic needs, especially under conditions of increasing unemployment or scarcity of basic necessities. What are the waste reuse and waste disposal patterns in the household and how do they vary with income, education and the structure of the household, or other social characteristics?

2. Surveys and interviews on attitudes of women to solid wastes. What is the level of knowledge about health hazards from uncollected solid wastes? An important issue to probe is whether the use of wastes as resources affects the perception of wastes as hazards. What general concerns do women have about access to wastes, neighbourhood cleanliness, and municipal solid waste services? These enquiries can move from individual perceptions to "collective diagnosis" (ref. 9, p. 240) that becomes a way of consciousness-building, laying the ground for community action.

3. Roles of women as waste pickers on streets and at dumps and in the sorting, processing, trading of wastes as feedstock for industry. It would be useful to know women's earnings, the conditions of their work, and the types of control exercised by men in the worlds of waste. Studies of the health risks of different kinds of waste work have yet to be undertaken.

4. Examination of the options for improving women's earnings and work, such as co-operatives [c.f. work of Self-Employed Women's Association (SEWA) in organising some paper pickers' co-operatives (ref. 9, p. 236)]. Case studies of co-operatives or other forms of organization in this work would be useful. Community organisations can help identify productive but non-hazardous waste recycling work (for instance the making of clothes and quilts from textile scraps) that could be supported to give women better opportunities for recycling work. Most of the general recommendations of the Government of India Commission on Self-Employed Women are relevant to waste work (ref. 9).

5. Knowledge and perceptions of women municipal waste workers of community needs and issues in solid waste services. Since most municipal workforces employ some women in city cleaning, their experience as both household managers and public cleaners could be drawn upon to provide insight into attitudes towards wastes and waste management behaviour in the community. Discussion groups of municipal workers could become a force for better adaptation of waste services to household needs. Showing respect for the knowledge and insight of women municipal workers is a first step in enhancing their self-esteem. Research must also identify the particular needs of women workers, with regard to child care, or possible risks for pregnant women, for instance.

Without waiting for research results, community development groups can explore the potential for integrating women's intimate knowledge of household wastes into a concern for "neighbourhood housekeeping" (ref. 10). By harnessing the knowledge that people have of their wastes, the activities of waste gathering and waste reuse, rather than being seen as largely problem-ridden, can be recognized as having environmentally positive elements. One hopes that this change in perception will lead to more constructive ways of accommodating informal practices to public management.

CONCLUSION

In striving for decent living and working conditions, communities need to look beyond the usual generalities of improving women's status, supporting women's work and providing appropriate community facilities, to probing the specific needs and relationships that arise from the fact that wastes represent resources and create particular employment opportunities in low-income communities.

Ultimately, as research on waste management and waste work proceeds in developing countries, scholars and community leaders may decide that anything "special" about women's relationships to waste management and waste work is overridden by the social, economic, and environmental deprivations of all those associated with the lowest, most polluted, levels of waste work.

There is some basis for assuming, however, that, through their household roles and informal and municipal work, women acquire distinct insights into attitudes to wastes and waste behaviours that until now have not been used for environmental improvement. Whether or not it is worthwhile to pursue research on women alone, solid waste managers must eventually address the phenomenon of waste recovery by the poor and consider how conventional plans for SWM can be adapted to waste recovery and recycling.

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Infrastructure for low-income communities

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Low income housing project Peshawar

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The St. Michael's Housing Society was founded in 1980. It's objective is to provide land and housing core units at affordable prices for the Christian community in Peshawar. Although it has received some financial help from outside, its aim has been to be as self-supporting as possible with society members paying the true cost of the facilities provided. This aim has not been met fully but, as we will see, the amount of subsidy to members is not large. After 10 years, the society is expanding and construction work continues apace at the colony. This paper presents a brief account of the history of the colony and gives some information on the ways in which technical and administrative problems have been solved. It is hoped that it will perhaps make a contribution to the solution of housing problems in Pakistan.

The main emphasis in the early days of the society was on collection of funds and the purchase of land for a housing colony. The original membership was limited to about 130 families, each of which was asked to pay a deposit of 3500/Rs. and monthly installments of 200/Rs. The capital generated by members was insufficient to allow the early purchase of land. With this in mind, grants were obtained from various organisations, in particular from the German organisation Misereor. The object of these grants was to provide the basis for a revolving fund for land purchase. Money spent on land would be recouped when members paid for it and would then be available for further land purchases. It is worth making the point that such up-front funding is essential if housing initiatives like St. Michael's are to succeed.

The purchase of land at a location north of Tehkal Bala village began in 1983. The site is about 4km. from the centre of Peshawar Cantonment and about 1km. from Tehkal Payan village. It is adjacent to several brick kilns and much of the land had been dug out to provide material for bricks. The cost of such land tends to be lower than that of agricultural land. On the other hand, land which has been dug deeply will be difficult to service so that construction costs are greatly increased. The depth of excavations on the St. Michael's site was limited and the site could be drained without pumping so the choice of site did not result in major problems. By early 1986, about 670 marlas (1.67 hectares) or land had been purchased at an average of about 2,300/Rs. per marla (one marla is 25.27 square metres). The land formed a rough U shape round three sides of a rectangular depression.

At this stage, the society faced some problems. Members had been promised 5 marla plots and preliminary house designs showed two rooms and a verandah. They had been told that they would have to pay 11,600/Rs. for their land plus the cost of house construction. No allowance had been made for the land that would be necessary to provide access to the houses and public spaces. Also, the cost of the proposed house design was estimated to be of the order of 40-50,000/Rs. and it was doubted whether most members could afford this amount. Further problems were technical in nature.

It was proving difficult to find someone to design a housing layout to make efficient use of the awkwardly shaped available space. A layout produced by a local engineer fitted only about 80 houses onto the site. It was irregular in form with no definite hierarchy of streets and with many plots having non-standard shapes. Because of these problems, the momentum of the project slowed and many members stopped their regular monthly payments.

A solution to these problems came about in a slightly fortuitous way. The Peshawar Development Authority engaged consultants to produce a "structure plan" to guide the future growth of the city. The consultants were also asked to produce proposals for new sites and services housing to ease the housing problem in Peshawar. One of the consultants team gave some assistance to the St. Michael's Society and there has subsequently been close contact between the society, the PDA and their consultants. This has been beneficial to both sides. The society has benefitted from the technical skills of consultants and PDA officers. At the same time, the St. Michael's scheme has provided an opportunity for the field testing of designs and techniques which may later be incorporated into government schemes.

In accordance with the professional advice now available, two important decisions were made by the society. The first was to reduce the size of plots to just over 4 marlas ($98m^2$ to be exact). This enabled almost 130 plots to be accommodated on the available land with adequate space for access roads and some public open spaces. The second decision was to provide only a single room and a sanitary core on each plot. This meant that costs could be reduced to a level affordable to the majority of society members. A layout was produced which aligned the majority and 5 meter wide access galis. Space for a 9 meter wide road was existing road from Tehkal Payan. (It is worth noting that some blocks in the southern part of the site were originally planned to be aligned at an angle to the remainder of the plots in order to follow the site boundaries as closely as possible. This layout was subsequently amended as it became clear that additional land would be purchased around that original site. The general point to be made is that layouts should, whenever possible, make allowance for future expansion of schemes.)

The Standard plot size adopted was 46ft. x 23ft. (14m x 7m). The 2:1 ratio between plot depth and plot width reflects in fact that servicing costs tend to reduce as the depth to width ratio increases. The 2:1 ratio makes site planning relatively easy and the plot width is sufficient to allow two rooms to be built across the plot. The core room has internal dimensions of 11.5ft x 11.5ft (3.5 x 3.5m). It was placed at the front of the plot in order to define the street and hence discourage encroachment into the right of way. This arrangement means that one wall is common where plots adjoin one another. The toilet/bathroom block is also placed at the front of the plot, thus minimising the length of water and sewerage connections. The original intention was to provide only the front wall to the plot but society members subsequently requested that a wall should be extended round the plots.

Construction began on site in late 1986. The society was lucky to obtain the services to another government institution, the Gulbahar Technical Training Centre. This institution provides training in building trades including brick laying, plumbing, joinery, carpentry and electricity. These indepth training courses are administered by qualified instructors using proven instructional methods over a six month training period. The site of the colony is an ideal place for practical training for the students. As it was done in the past at the training centre, houses are built and then dismantled for the purpose of practical experience.

Now however, the students can build houses at the colony and allow them to stand giving them the additional satisfaction of seeing their work remain in good condition after years. In this way the housing society members benefit from the students work and the Technical Training Centre benefits through the materials provided by the St. Michael's Housing Society. To date they have completed 135 housing units and 12 more units are in the process of completion, they have income also started a shopping centre. The shopping centre will provide income for later stages. Those who want to take a shop will have to pay rent and that money will go into the society fund for the common good of the colony. Up till now the society has acquired 1482 marlas of land. The training centre is supported by the German technical aid agency G.T.Z.

Several aspects of the core unit design and construction are worthly of note. Mud mortar has been used in all brick walls in order to reduce construction costs. Rooms and sanitation units are pointed externally and rendered internally with cement, sand mortar. Some time into the project, experts advised that cement, sand pointing should not be used with mud mortar joints since the pointing would become loose with time. However, no problems have been experienced over three years after the first units were constructed. Another feature is the use of pre-cast concrete beams and slabs in roof construction. These are produced by a factory at Pabbi, some 20km from Peshawar, and have the advantages of being cheap and easy to use. The total cost of beams and slabs for the core room and sanitation block roofs was about 1530/Rs. per unit in 1986. The concrete roof is surrounded by a brick parapet and covered in a thin layer of concrete and 150mm of mud for insulation purposes.

Another interesting initiative, albeit one which has not been followed up by society members, was an experiment with the use of pressed mud blocks for building walls. A machine for producing pressed cement stabilised blocks was brought from Germany in May 1986. Experiments with cement stabilised blocks led to the conclusion that they were not greatly cheaper than the locally available bricks. Moreover, people expressed a strong preference for brick over what they perceived as "katcha" blocks. However, a large number of mud blocks without any cement stabiliser had been produced while the machine was being tested. These were stacked on the site and were still in good condition a year later, despite being subjected to the ravages of the weather. (The only damage was to those blocks at the top of the stacks which were directly exposed to rainfall).

It was decided to use some of these to build a further two rooms on one plot as a demonstration project. The completed work includes a combination of brick and mud-block construction with a pre-cast concrete roof. The mud-block walls are rendered internally and externally with cement, sand mortar.

The expert advice that this mortar would crack has provided correct but cracking has not been extensive and has been easily repairable. A better alternative would be to use lime mortar but it was not possible to find sources of lime in time for the work. The structure has been standing for over 2 years now without any problems other than the cracks in the render. However, no society members have used the technique, even those who are unable to afford to expand their accommodation using conventional materials.

Water is supplied to a single tap or each plot in the scheme. The source of water is a deep tubewell which was sunk to an artesian aquifer at a depth of about 600ft. This supplies water under pressure so that no pumping is necessary. The tubewell was sunk under contract by WAPDA with funds supplied by the Dutch Government. The yield of the tubewell is estimated to be at least 1.5 cusecs (55 lt/sec.) at a head of about 50ft (15m). Unfortunately, lack of experience with sinking artesian wells resulted in a failure to adequately seal around the tubewell casing. This means that water escapes outside the casing if an attempt is made to restrict the flow inside the casing. It is therefore necessary to let water which is excess to requirements go to waste. While this is wasteful, the experience with the tubewell suggests that the artesian aquifer could be used to supply part of Peshawar's water needs if properly tapped.

Each plot is provided with a connection for the sanitation block to a sewer in the street or gali. Connections are 3.5 ins. pvc inside the plot leading into 4 ins. concrete pipes under the galis. Main sewers are 6 ins. and 9 ins. dia concrete. All concrete pipes are plain ended with joints made using cement mortar over a sacking filter in the joint itself. This is the technique commonly used to make house connections and private sewers in Pakistan. Sewage is treated in two septic tanks, each serving about 80 houses, and is then discharged to the existing drainage system. There is scope for the installation of a small waste stabilisation pond system to provide additional treatment.

This might be combined with ponds for fish farming which could provide income for the community.

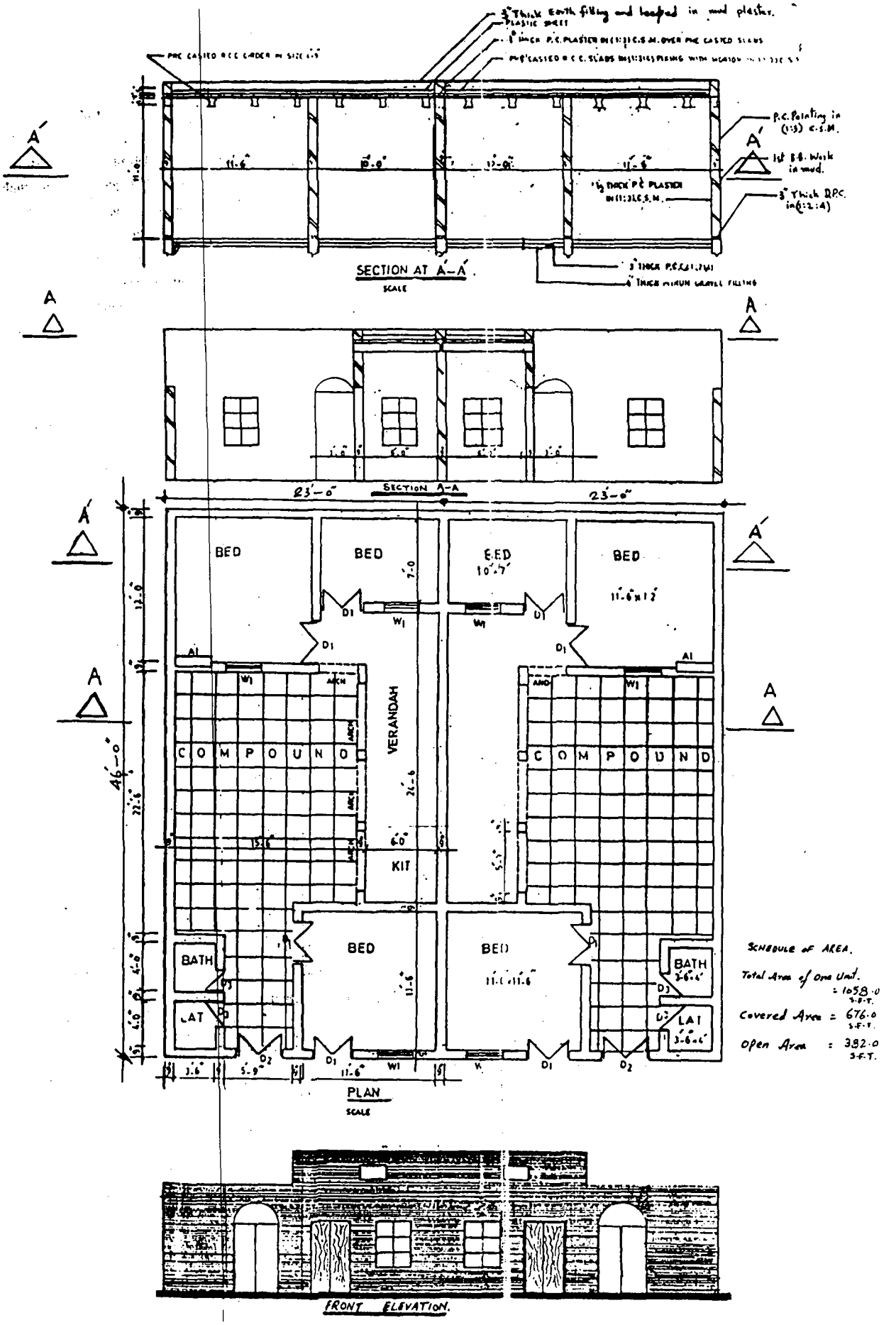
Streets and galis are paved with bricks laid on a mortar bed. The bricks are grouted with cement, sand mortar. Most of the site is on ground which has already been excavate and the sub-grade is good and firm. No problems have been experienced with brick-on-edge pavement in 5m. wide galis and bricks laid flat in 3m. wide galis. Surface water drainage is provided by dishing 3m. wide galis and construction shallow channels on either side of 5m. wide galis. The channels were intended to take flows generated by low intensity rainfall with higher flows carried on the gali surface. However WAPDA placed their electricity pylons squarely in the channels, thus blocking them. In future it will be preferable to slope the 5m. galis to a central shallow channel. One covered channel is provided through the site to carry run-off from the higher ground which lies to the west.

People began to move into the housing colony in mid 1988 and occupation of plots proceeded rapidly once electricity supplies were installed in 1989. The colony is now a thriving community.

Many houses have been extended far beyond the single core room. This suggests that many members have a fairly high level of savings. Other members have occupied the single core room hile they save to add additional rooms. Land purchase has continued over the years and at the asking price in the area is now typically of the order of 5-10,000Rs. per marla. The original membership of the society has been expanded and additional funds have been obtained to increase the amount available for the revolving fund. To date the society is 260 members strong and new applicants approach the society regularly. In the first phase, society members could move onto their plot after paying 24,000/Rs. to the society. They then pay a further 6,000/Rs. at a rate of 200/Rs. per month. This was done tolessen the burden on the members of monthly expenses for both their present and future housing, however, the society experienced difficulty in collecting these monthly payments from those who had moved into the community. Therefore in the future phases it is requested that full payment will be made before moving onto the plot. The actual cost of the land, plus core buildings was approximately 36,000/Rs. total is made up of land cost, building cost, and various other expenses including land fill and leveling, road surfacing, sewer system, electrical hook-ups, water supply, etc. Obviously, these costs have risen with time and will continue to do so and thereby some increase in charges will be necessary for those new members included in the later stages of the scheme. Monthly installment rates are presently 300/RS. over a period of ten years. To stretch these payments over a longer period may discourage the member.

St. Michael's Housing Society has an elected committee consisting of the president, vice president, treasurer, secretary and 5 other members. Once a year the society have an election, as well as giving the statements of accounts and position of the society. Once a month the committee meets and discusses running problems to be dealt with and most decisions concerning the society are made at this time. At present 47 families are living in the colony, some are busy constructing their own part and others are preparing the difficult task of moving in, but there is great activity throughout the community.

The success of the society is that different groups are working together for the same goal, helping where ever and whenever is necessary so that even the poorest are able to aquire a plot and a house and thereby a position in the community.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23'-0"
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SCHEDULE OF AREA.
Total Area of One Unit. = 1058.0 S.F.T.
Covered Area = 676.0 S.F.T.
Open Area = 382.0 S.F.T.

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Infrastructure for low-income communities

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Site conditions in infrastructure development

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INTRODUCTION

Either through discriminatory zoning regulations or through the influence of market forces of demand for the limited urban space or as a phenomenon of pure chance, low-income urban settlements are to be found located on sites that would otherwise be described as 'difficult' for housing development. The terrain is either too rugged and steep or it is too flat and swampy for effective drainage; the soils may also depict very poor engineering performance characteristics. Also since the development of infrastructural services often takes place within an already haphazardly built-up area, the settlement pattern also presents its constraints that have to be contended with. The institutional and administrative bottlenecks need no mention here (Ref. 1).

Kitui, Kanuku, and Kinyago villages are typical examples of unplanned low-income settlements to be found in Nairobi, Kenya. The paper looks at how site conditions have affected the development of sanitation infrastructure services in the above villages, and in particular the problem of disposing of increasing volume of sullage - the liquid component of domestic waste water. The paper proposes a model aimed at handling the disposal of sullage in the study area and in other isolated settlements in tropical countries with similar site conditions and constraints.

Background

The present settlement form of Kitui, Kanuku and Kinyago villages started in 1983 after a fire destroyed former cardboard and plastic paper house structure units on June 12, 1983. Undugu Society of Kenya (a Non-governmental organisation), together with the local community, has been in the forefront in assisting improved development of the villages.

With a present population of 5000 people and an average household size of 5 persons with a monthly average income of Ksh.500, the study area is located about 3 kilometres from Nairobi CBD, downstream along Nairobi river. The settlement is spread along the immediate valley slopes draining into the river and also along the floodplain.

SITE CONDITIONS

As mentioned above, the study area is located on the immediate slopes overlooking Nairobi river. The ground rises from 1628 metres to 1636 metres above sea level with an average ground slope of 1 in 9. Part of settlement is however located within the river floodplain. The soils are predominantly black cotton soil underlain by Kerichwa valley tuffs and the floodplain soil is a mixture of alluvial clay soils.

A site inspection indicates that the area suffers from frequent floods that often wash away the built house structures. The flooding problem is made worse due to the sluggish river flow caused by vegetative growth and dumped solid waste in the river. The river is heavily polluted as it passes through the city. In the dry period, for example, the natural flow in the river is so low that the river is virtually an open sewer for the dissolved oxygen content is barely more than 0.5 milligrams per litre and is often nil (Ref. 2).

Rainfall figures in Nairobi give an annual average of 900mm with two main rain seasons in March-May (long rains) and the short rains of October-December. Heavy thunderstorms are not uncommon and result in local floods. The average temperature varies between 17 and 20 degrees centigrade, although temperatures can be as low as 4 degrees centigrade and as high as 33 degrees centigrade.

SITE CONSTRAINTS

What constraints do the above site conditions present to the provision and development of sanitation infrastructure? After assisting the local community in the construction of the house structure units, Undugu Society now faces the task of extending services to the study area. Having utilized all the land on the valley slopes for the construction of residential units, the only open area remaining is along the river floodplain.

Efforts to build pit-latrines along the flood plain have not been fruitful. With unstable alluvial soils and a watertable within 1 metre, the pit-latrines are barely 2.5 metres deep. Due to unstable conditions,

the walls of the pit often collapse and cave in. The situation is made worse by the floods that wash everything away.

Having extended communal water points into the study area, the residents now face a more serious environmental problem caused by the waste water generated (Ref. 3). The problem is particularly acute in respect to sullage - the liquid component of domestic waste water - that is found everywhere around the residential units. The residents cannot connect to the city trunk sewer nearby because the line is located on the upper grounds relative to the settlement area, and the connection fees is too high. It is estimated that a connection fees of over Kshs. 1,000,000 is needed for 6 such connections. How will the local community solve the problem of disposing of the increasing volume of sullage?

PROPOSED MODEL

One major constraint to the implementation of civil engineering infrastructure programmes among the unplanned low-income urban settlements is the high cost of development (Ref. 4). This is also made more difficult by the inappropriateness of many conventional technologies in use today and their environmental sustainability limitation in respect to socio-economic and site conditions.

Considering the socio-economic and site conditions of the study area, the paper has proposed a model to handle the disposal of sullage produced in the area (Ref. 5). The model proposes the following developments along Nairobi river flood plain that is presently under-utilized:-

1. The development of a sand-filter bed zone into which the small bore sewer system discharges sullage effluent produced in the villages (Figure 1);

2. The development of a graded eucalyptus tree zone or a similar tree species with a high rate of transpiration and waater-uptake and able to withstand water-logged conditions(Ref.2); and

3. The training of the river by deepening and lining the river channel to allow more effective water flow in the river to minimise the flood problem and lower the water-table (Figure 3).

Figure 1 shows a sand-filter trench that receives sullage and treats the waste as it percolates through the sand media. This system is ideal for site conditions where the water-table is within 1 metre of the ground surface (Ref. 6). It is estimated that the quality of the effluent from the sand filter media is safe enough as to be discharged into the surface water point like Nairobi river (Ref. 7). In order to enhance the loading capacity of the sand-filter media, a eucalyptus tree zone is proposed (Ref. 8). The eucalyptus will improve the uptake of water from the likely water logged soils along the floodplain, besides improving the porosity of the alluvial soil and consequently the infiltration of water through the sand-filter media. The nutrients in the effluent will greatly enhance and support the rapid growth of the eucalpytus.

CONCLUSION

It is envisaged that the proposed model will offer the following benefits, if proven successive:

1. The enhancement and protection of the urban environment, minimising costs of treating waste effluent, and maximise the utility of otherwise abused and idle land along the river.

2. The model should appeal to many isolated settlements that may not be served by central trunk sewer lines and many other smaller concentrated settlements in dry regions within the tropics.

It is important to note that the proposed model has yet to be tested. The aim of presenting it in the conference is therefore to receive a critique and comments as to its viability so as to improve it before it is actually tested and applied. It is the anticipation of the authors that the comments and support received from the conference will go along way to advancing the search for more effective technologies to support development among the poor in developing countries.

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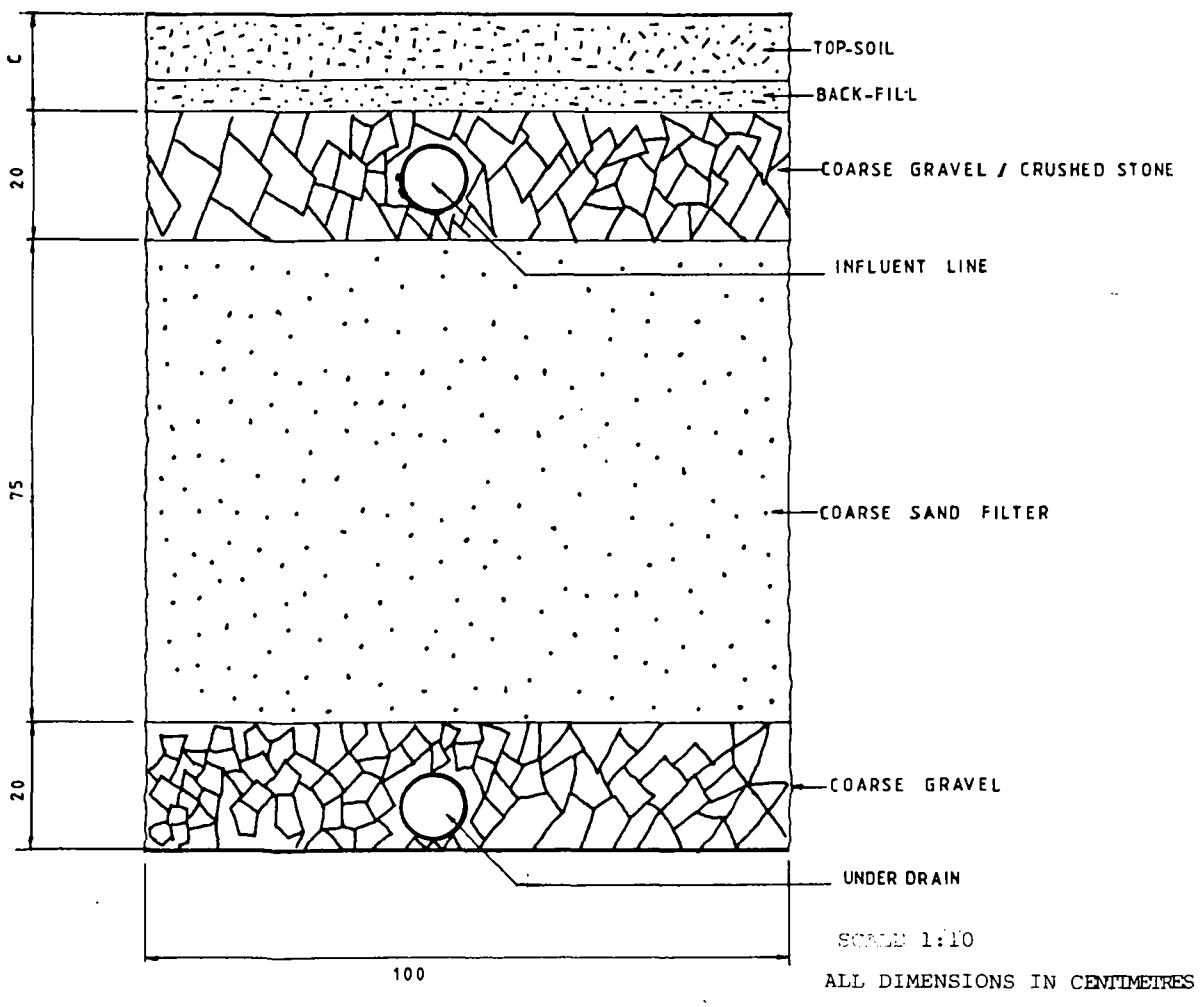
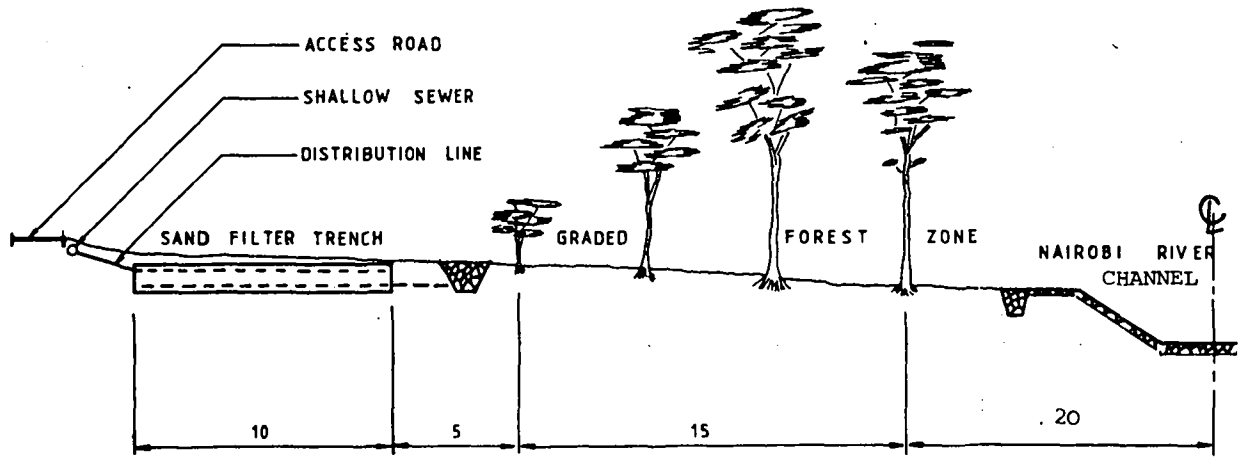


FIGURE 1
A SECTION THROUGH SAND-FILTER TRENCH

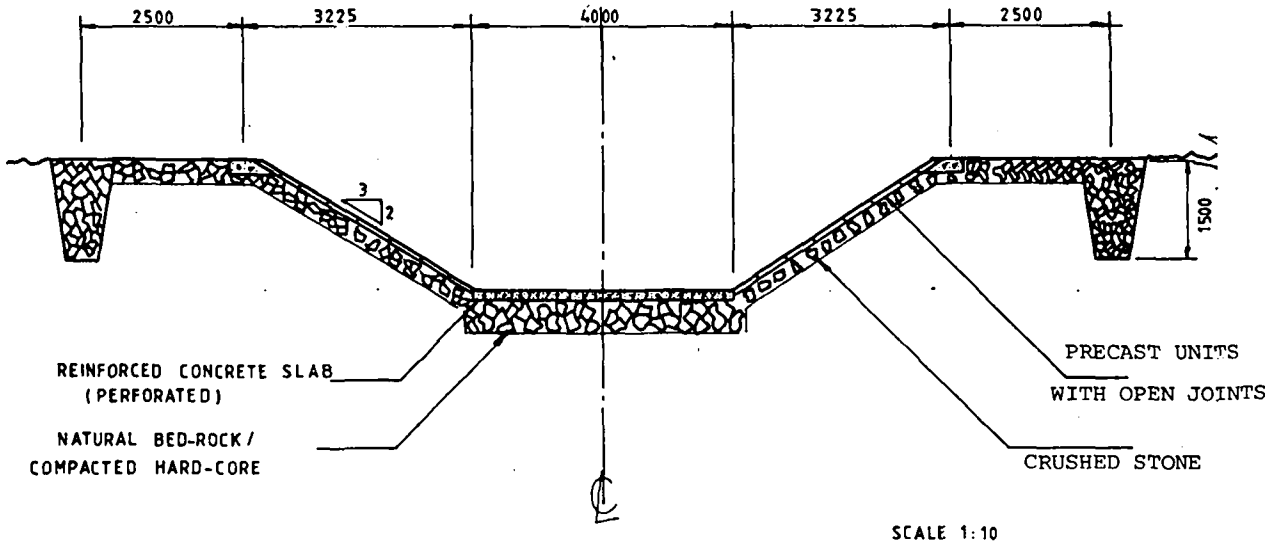


SCALE 1:250

ALL DIMENSIONS IN METRES

FIGURE 2

PROPOSED WASTEWATER DISPOSAL SYSTEM AND RIVER DEVELOPMENT



SCALE 1:10

ALL DIMENSION IN MILLIMETRES

FIGURE 3

PROPOSED RIVER CHANNEL

16th WEDC Conference
Infrastructure for low-income communities
Hyderabad, India 1990

Site and services programmes in Sri Lanka

Mrs A D D D Pathirage

ABSTRACT

This paper will attempt to discuss one of the main housing programmes introduced by the Sri Lankan government in order to improve the quality of life of the Sri Lanka -an urban poor.

Sri Lanka is a small island with difficult socio-economic problems confronti- -ng its fifteen million inhabitants. Appr- -oximately 16% of the total population lives in urban areas and one half of the urban dwellers are without steady jobs and they live in old buildings or in unauthorised shanties.

Sri Lankan government believes the housing provides a key to the solution of many problems in the country and the sites and services programme was introduced in urban cities to provide the urban poor a buildable land with necessary services and a housing loan.

The National Housing Development Auth- -ority of Sri Lanka is responsible for mak- -ing the programme a success with minimum involvement of goverment and maximum commit- -ment of the target communities.

Benificiaries are given a plot of 50 meter square in size under this programme and it is the task of the Engineers and Planners to fit in all the services in this little space.

The programme was launched in 1984 and the Housing Development Authority of Sri Lanka is proud to say that this was able to solve the urban housing problem to a greater extent and wide experience and knowledge gained through this had made the programme well improved.

So far the lands and the services had been given to the communities free of cost and now the stratergies are being worked out to recover the costs involved from the beneficiaries.

THE SCOPE OF THE PROGRAMME

The main aim of the site and services programme is to improve the living conditio- -ns of the slum and shanty dwellers in urban areas.

The informal settlements of the urban low income group are called gardens and the people who live in these gardens are migran -ts who had moved into cities from various places many decades ago.

They are the people with worst houses in Sri Lanka. The rural poor also suffer the housing problem. But they can put up a house with mud walls and a thatch roof without any cost. Thatch and the necessary roof timber can be easily obtained from forests. Mud is freely avilable. They can dig a bore hole toilet in the bush. There is plenty of land in the rural areas and they can dig the pit for the latrine as well as the drinking water well in the same plot without violating public health standards.

But in the city the things are very different. Everything has a price and even the marshy land is very expensive. Urban poor will have to buy cardboard cartons and the drums for the roof. Water is not free for them. They don't have proper sanitation facilities. Therefore the infant and child mortality is relatively high. These people suffer from water related diseases due to lack of access to sanitary toilets and safe drinking water.

Unfortunately these communities had never been received the attention of city planners since 1984 even though they consist of one half of the city population. They were not conventionally recognised as a part of the city.

Before 1984 almost all the urban devel- -opment plans were for the first half of the city and investments on roads, sewers, eletricity, drainage, water services etc. was only for the areas where the middle class and the formal working class lived.

But in 1984 with the introduction of million houses programme this conventional thinking began to change and doors of urban benefits were opened for the slum and shan- -ty dwellers as well.

In 1984 sites and services programme was introduced by the government to look

in to the housing and related matters of this shanty dwellers and the main components of the programme were

1. Provision of land and security of tenure.
2. Provision of infrastructure and services.
3. Assistance for house construction.
4. Skill development and social promotion activities.

HOW THE PROGRAMME WAS PLANNED

The site and services programme had been planned in an entirely different way based on the lessons learnt and the experi--ence gained in the hundred thousand housing programme implemented between 1978 and 1982.

The new policies were drafted in the year 1982 and the year 1983 was the planning year.

The programme planned to recognise the efforts of the urban poor to improve their standard of living conditions and to support such efforts by providing security of tenure and acces to resources and amenities which they can not reach otherwise.

National Housing Development Authority Of Srilanka and its role in the programme

The National Housing Development Authority Of Sri Lanka was formed in 1978 as a semi government organisation to provide bett--er housing conditions for the majority of the population in the country.

The organisation has Administration, Finance, Rural Housing, Urban Housing, Engineering Services, and property management departments. The Urban housing, finance and Engineering Services division are the key units involved in the sites and services programme.

The role of N H D A in this programme was to intervene minimally while providing maximum support to the beneficiaries.

To achieve this objective it was planned to have two way communications between N H D A and the house builders. The aim was to assure the communities that the support is to achieve what they want, what they can operate and what they can maintain. Almost all the decisions in the planning stage to be taken through negotiations between N H D A and the beneficiaries.

As it is not practically possible to dialogue with all of them the community development committees (CDC) are formed from the target communities. N H D A officials and the CDC will have to negotiate and draw up plans regarding following activities.

- Demarcation of project boundaries
- Registration of house holds
- Socio Economic Survey
- Preparation of regularisations plans
- On site blocking out
- Detailed engineering designs
- Issuing of deeds
- Preparation of contract documents and awards
- Contract payments
- Issue of housing loans and loan repayments
- Technical advises on house construction
- Skill development and social promotion activities.

IMPLEMENTATION OF THE PROGRAMME

Provision of land and security of tenure

When government recognises the efforts of a certain shanty community to improve their life style N H D A is informed about that particular settlement.

Then a socio economic survey about the community is conducted by N H D A with the community members.

Very often these people live in private government or municipal lands which are reserved for public purposes such as road reservations, canal banks, railway reserva--tions etc.

N H D A look for alternative lands for the resettlement of these people. the majo--rity of lands available for urban resettle--ments are marshy and the risk of flooding is very high in those lands. Therefore they have to be reclaimed to provide a buildable land for the shanty dwellers.

The sites are selected by N H D A with the Community Development Council of the target Community and they are purchased by N H D A from the owners. Then these are filled at a gradient of 1/500. The site base level is determined from one in 5 year flood level. Adequate drainage facilities are provided to avoid inundation of the site due to waters from sorrounding areas. Land preparation is often done by private contr--actors with the supervision of N H D A officials as well as the CDC members.

Once the land is prepared the blocking out is done on site by N H D A planners surveyors, engineers and technical officers with the beneficiaries. Normaly 70% of the project area is allocated for housing and community buildings and 30% is allocated for roads and other open spaces. Due to scarecity of lands in major cities of

Sri Lanka very often beneficiaries are given a plot size of 50 m^2.

Deeds are issued to them by N H D A and they become rate payers of the municipal council.

Provision Of Infrastructure and Services

Infrastructure and services provided by N H D A to support the housing are

- Drainage
- Roads
- Water Supply
- Sanitation.

The solid waste collection and the electricity supply is the responsibility of the municipal council and therefore N H D A does not involve in them directly.

Drainage- Provision of adequate drainage system is essential to prevent the site deterioration. Very often N H D A provides drains to carry storm water as well as sullage. Mostly the main drains are lined and the sullage is carried away by earth drains. The drainage network is decided and drawn by N H D A engineers with the help of the CDC members and very often the construction of drains is done by CDC, with N H D A funds.

Roads - As the land is very expensive in the urban areas and very often a substantial amount of money has to be spent on the ground preparation the road widths are reduced to the minimum required.

The roads are usually constructed with gravel. Only the site access roads are paved with bitumen.

Road construction is usually done by the CDC with N H D A funds.

Water Supply -Very often the communities prefer to have house hold pipe borne water. N H D A makes arrangements to get the water conections from the city water mains.

Pipe laying and the other constructions related to water supply is often done by CDC with N H D A funds.

Sanitation -Even though the Plot sizes are so small individual pour flush pit latrines are constructed in many schemes. If city sewers are running closer to scheme N H D A makes arrangements to connect the sewerage network of the site to the city sewers.

ASSISTANCE FOR HOUSE CONSTRUCTION

When living in unauthorised settlements the dwellers know that the land on which they reside is legally very insecure and at anytime they can be evicted. Therfore always they make very temporary structures and the construction of permanent houses is outside their experience.

So once these families get access to land and other urban amenities N H D A has to guide them regarding all the technical matters related to house construction.

All families are offered access to a housing loan of 230 sterling pounds at 10% interest rate which is much lower than the commercial interest rate on housing loans. Beneficiaries will have to pay 2.5 pounds a month over a period of 15 years to settle the loan.

The average cost of building a house with 2 bed rooms, kitchen and a living area is 575 pounds. So the housing loan provided is not sufficient to complete the house and some people borrow additional money and some people complete with their savings.

Different loan packages and housing options are offered to people who can not afford to pay 2.5 pounds monthly.

Skill Development and Social welfare

Skill development- Training and education is provided to communities in order to make them self reliant. within a short period several community training techniques had been developed and integrated with the pro-ject development process.

Various workshops are organised by N H D A in order to familiarise the communities with the potential as well as the limitations of participatory approaches. Leadership workshops are organised for community leaders to train them in various manegerial aspects.

Social Welfare - Programme had provided good access to health services, child care practices, pre schools and various training classes.

The health visitors make frequent visits to new settlements and various instructions are given especially to pregnant mothers and children. The immunisation works are carried out in the settlements it self.

Pre schools and day care centres had been started in the new settlements by the municipal councils and various non governmental organisations.

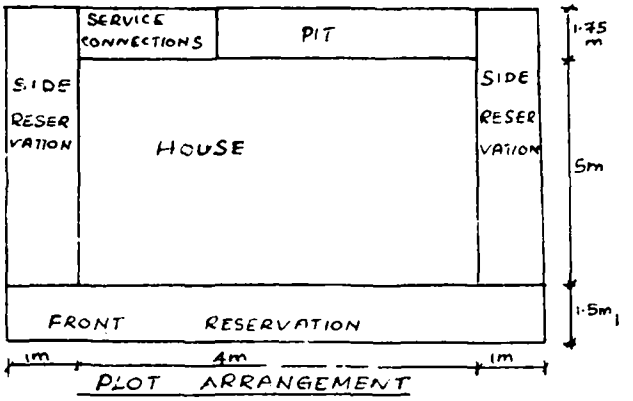
PROGRAMME FUNDING AND COST RECOVERIES

There are 2 ways by which the programme is financed. They are the government funding and the funds from various non government organisations and lotteries.

N H D A has to spend 200 pounds on

land and 364 pounds on infrastructure and services. Another 230 pounds is provided for house construction. So the total expenditure per plot is 854 pounds and only 230 pounds is paid back.

This is a very poor cost recovery and N H D A is now making arrangements to imple-ment the ways of recovering the land and infrastructure cost from beneficiaries.



PLOT ARRANGEMENT

PROGRAMME EVALUATION

The author had been closely involved in the programme since 1984 and had studied about operation and maintenance, housing loan repayments and cultural and social changes of people in many completed projects.

Operation and maintenance - These schemes are planned to be operated and maintained by the beneficiaries with the assistance of the municipal council. So far these had been done up to satisfaction in many completed projects

But failures had been observed in some projects and it was found that the cause is that the beneficiaries had not been provided what they want and what they can maintain and operate within their capacities.

Housing loan repayments - It was mentioned earlier that the beneficiaries get the land and infrastructure free and only the housing loan has to be repaid. The studies done in this reveals that the percentage of loan reco-veries is about 35% on average.

Cultural and social changes - Middle class urban societies has a certain image of shanty dwellers. They are considered as people prone to violence who are unreliable and engaged in many illegal activities. So these people had been rejected culturally and socially by the other city dwellers.

Once these people are resettled and given the basic amenities it has been obser-ved that they make attempts to integrate themselves into an urban lower middle class style of life and try to dismantle the image of them as a kind of threat to urban formal sector.

They express a desire to keep to them-selves.

The way of thinking about the 'rights' over the material assets of the community also had been changed. Usually shanty dwell-ers do not oppose their neighbours using amenities such as toilets, taps, foot paths etc. But it was observed that these attitu-des had been change and now they take strong objection to people from neighbouring shanties using water or sanitation facili-ties.

CONCLUSION

In concluding author wishes to say that the programme had proved it self as an efficient and responsive system for, low income housing, This had been largely succ-eded in achieving most of its initial targets.

To achieve all the objectives of the programme poverty should be alleviated and the present government had introduced a gagantic poverty alleviation programme throughout the island.

ABBREVIATIONS

NHDA - National Housing Development Authorit Authority of Sri Lanka.

CDC - Community Development Councils

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16th WEDC Conference

Infrastructure for low-income communities

Hyderabad, India 1990

Slum upgrading programme in Tamilnadu

Dr K N Ramamurthy

INTRODUCTION

Slums exist in all metropolitan cities of the world. Slums should not be seen as 'eye sores' and illegitimate settlements; they should be identified as communities of the urban poor which have arisen in response to the acute housing shortage that exists in the lower income communities. Though it is an accepted fact that housing is one of the basic necessities, none of the government agencies have been able to provide the housing and infrastructure at affordable cost to the urban poor, particularly in the developing countries. In the city of Madras, India, the slums contain more than 30 percent of the population of the city. It is estimated that in the Caribbean and other developing countries, the slums and squatter housing constitute about 30 percent of the existing building stock. It is a fact that the slum and squatter communities have exhibited their creative capabilities of inventiveness and self-reliance in erecting their shelters at affordable and low costs mostly through cooperative efforts and self-help. The government agencies should encourage active involvement of the residents in the provision and maintenance of the infrastructure and service facilities through collective self-help particularly in the low income settlements.

SLUMS AND SQUATTER SETTLEMENTS

Slums are formed mostly due to migration of the underprivileged from rural areas to urban centres, increased population growth and acute shortage of housing. The slums can be classified based on the method of formation: Linear slum along water front, Linear slum along road, Cluster of huts on identifiable sites and Planned hut developments. Slums in the city of Madras, India, cover 6 percent of the total area of the city and they contain more than 30 percent of the population.

Slums can be analysed from two view points. The traditional approach is to view slums as 'eye sores' and illegitimate settlements which do not conform to urban norms. The modern view is to consider the slums as the communities of the urban poor which have risen in response to acute shortage of low income housing. The former attitude is based on superficial notions of beauty and civic order, whereas, the latter is derived from an understanding of the needs of the urban lower classes and an appreciation of their creativity to satisfy their needs through self-reliance. The first approach leads to bulldozing type solutions and evokes stringent regulatory measures and other calls for a thorough understanding of the functional role of these communities and require public policies which would mobilise the peoples' inventiveness and self-reliance.

SLUM CLEARANCE AND IMPROVEMENT PROGRAMMES IN TAMILNADU

The Tamil Nadu Slum Clearance Board was formed in the Year 1971. The tasks assigned to the board are: Clearing all slums in Madras within a targetted period and Providing basic amenities in slums. Under the slum clearance scheme, the existing slums were demolished and multistoreyed buildings were erected on the same site. Each 3 to 4 storeyed block contains about 40 tenements with a plinth area of 25 square metres for each household. Each tenement has independent water supply, toilet and electricity facilities. But the experience has shown that the impact of the slum clearance programme has not been significant. The main reason for the failure is that while planning such tenements, the technical, functional and social needs of the residents were not considered. This gave rise to community resistance to such projects. When the multistoreyed tenements were constructed, they were raided by the higher income groups and huts used to reappear at the fringes of the tenements in some cases. In many cases the tenements were showing signs of rapid degradation. Under the Slum Improvement programme, even though some improvements were carried out, the desired objectives were not fully achieved since there was no organisational structure to take care of maintenance and further improvements.

SLUM UPGRADING PROGRAMME

The failure of the Slum Clearance and Improvement programmes paved the way for the introduction of the Slum Upgrading Programme. The improvements envisaged in the programme are the following: Drinking water supply with public stand pipes, Paved pathways, Public toilet facilities and other Community

facilities such as schools, clinics and shops. An important feature of the scheme is to provide land tenure to slum dwellers. Another significant feature of this programme is the supplementary programme of training the slum dwellers in various skills such as driving, handicrafts and cooking. In the upgrading programme the level of service facilities has been based on the affordability levels. While fixing up the priorities for the improvement, the views of the local inhabitants were given due consideration.

The upgrading programme (1976) was successful mainly because it provided the residents - A share in decision making, The opportunity to build, and An experience of close cooperation with the city council and among themselves. It has been noticed that when the slum dwellers are assured of their land titles, they take great care in improving their shelter and environment.

While promoting any environmental improvement programme, it is necessary to consider how the people want to live, how they live at present, the effect of environment on their lives, etc. It is here that the citizen participation in planning will provide a favourable contribution in the management of such programmes. It is to supplement and help the professional planners in providing additional information on the realistic needs, wants and special characteristics of the community.

While one of the slums in the North Madras was being upgraded a small number of families have been rendered homeless. They were offered accommodation in the neighbouring sites and services scheme.

It is necessary to make the community realise the importance of the protection of the local environment and proper maintenance of the sanitary facilities. One of the ways of achieving this is to involve the community while deciding about the location of such facilities and their maintenance. Similar approaches of comprehensive environmental improvement were followed in the upgrading programmes in Bombay and Calcutta, India.

SITES AND SERVICES PROGRAMME

Sites and services programme envisages development of building sites with the provision of infrastructure including water supply and sanitary facilities. The cost of infrastructure in providing the utilities will depend on the size and shape of the plots and the road layout. A radial layout pattern has been tried for the various sites and services schemes in Tamil Nadu, India, where the individual sanitary core units of a group of plots are arranged around a central point. This eliminates the necessity of carrying the network of utilities along the length of plots. From the central core area, the utilities are directly made available to each of the plots in the circular group of radial plots.

SELF-HELP IN HOUSING

The squatters have shown the possibility of creating their own shelters by the use of locally available or used - second hand materials like automobile parts, wooden crates, tar drums, etc., mostly through cooperative efforts and self-help. In most of the developing countries including the Caribbean, the squatter housing constitutes more than 30 percent of the present housing stock. A social survey carried out in Trinidad has shown that the residents are interested in working collectively towards effecting environmental improvements. The government should come forward to encourage such active involvement of the benefitting residents in the provision and maintenance of infrastructure and service facilities through collective self-help schemes.

The potential of the aided self-help can be seen as it enables an organised and controlled contribution, using the low cost unspecialised labour and technologies appropriate to the local conditions. Self-help approach also provides supplementary employment to the residents, which thereby results in effecting improvement in their affordability levels. Self-help facilitates greater participation of the user in the planning and development phases of the residential layouts and will ease out any possible conflict which may arise out of possible relocation of the housing sites while carrying out an upgrading operation.

The 'Informal Bazaar Economy' has proved, in most situations, highly efficient in absorbing minimal capital resources and putting them to uses which generate considerable 'multiplier effects' and employment absorption capability. The informal housing sector must also be recognised as an integral part of the housing and the provision of service facilities should be extended in a phased manner, preferably through the collective self-help approach.

EVALUATION OF SLUM UPGRADING PROGRAMMES

In the past decade many countries in the Third World have successfully carried out slum upgrading programmes. It is a well accepted fact that slum upgrading is a means by which the poorest segments of the urban population are provided with low cost shelter

and with low cost access to employment. Zambia carried out slum upgrading to solve the problem of the squatter housing. In these programmes careful planning and great care were exercised to secure the trust, approval and active cooperation of the residents.

The upgrading facilitates step-by-step development according to the needs of the dwellers and resources. The role of the government is to create a framework in which people do things for themselves on a continuing basis according to their own needs and priorities, and in such ways that the resources are mobilised from among the local community. A United Nations Seminar held in 1970 identified the objectives of settlement upgrading as incorporating the initiative, organisational ability, and the capacity for work of the marginal population of the urban community for achieving the greatest social benefit with the limited resources available.

The magnitude of the urban growth, the increasing realisation that it cannot be prevented and the limited resources available for housing, have led many governments to accept 'Sites and Services' and 'Upgrading' projects. In many countries the two approaches are carried out in conjunction. This has the additional benefit of permitting the households displaced from an upgrading area to be offered a plot nearby with minimum of delay, and also permit the installation of facilities such as schools, health clinics and commercial centres if there is no space available in the existing settlement.

It is clear that from the extensive activity in housing by the occupants from all walks of life, rich or poor, that people are keenly interested in housing and are prepared to spend time and effort on it. The government should find ways to simulate participation of the people in housing action and mobilise the creative energy of the people through formal agency mechanism to achieve the societal objectives.

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16th WEDC Conference

Infrastructure for low-income communities

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Housing costs and appropriate building materials

P C Shah, Prof M M Tamakuwala, Prof N C Shah and C M Desai

ABSTRACT

Now a days, low cost housing has become a crying need in almost all developing countries. Increase in population, industr--ialisation and consequent urbanization, migration of more low income people to cities, increase in cost of construction materials etc. are the factors that contri--bute to this very situation. Different efforts are being made by all developing countries to tackle the problem in different ways. The planning, design, research and construction of low cost houses for developing countries are taking place according to the needs and perfor--mance requirements of the occupants. Of course, it changes from place to place and country to country, according to administration, resources of finance, ava--ibility of technical talents, construction materials, social condition of people etc. etc.

This paper riview the recent research on suitable low cost modern materials for environmental design of buildings.

INTRODUCTION

Nearly 80% of India's population live in villages and 20% live in urban settlements scattered all over the country in very poor and substandard conditions full of deficiencies of decent living. The National Building Organisation has estimated the shortage of housing in India as 15.6 millions dwelling units, 11.8 million in rural areas and 3.8 million in urban areas which will swell to 50 million dwellings by the year 2000. Acco--rding to the report of the working group on Housing, about 80% of the rural people are living in Kutcha Structures with mud flooring, walls and roof built of grass reed and thatch. About 2% live in Pucca Houses with plastered flooring, brick walls and concrete/tile roofing.

The problem of housing has reached staggering proportions and the existing backlog is compounding year after year. Housing of masses, particularly in the developing countries, because of accum--ulated shortage, shrinkage of conventi--onal materials of construction, high cost of prevailing techniques and the demand for more comfortable accommodation, has placed on the community of professional engineers, builders and manufacturers the obligation to invent more economical and acceptable materials for building construction as it accounts for 65% to 75% of the construction cost. We should be able to evolve suitable technology to bring into use locally available buil--ding materials that are within the easy reach of the common man and especially the Economically Weaker sections. The common man should be able to put up his house under self-help programme with--out much of skilled labour and machinery for erection.

BUILDING COST AND ECONOMY

Construction is an integral part of all development activities. It accounts for more than 50% of the total national plan outlay. Half of the expenditure on various types of construction is spent on building and housing construction. Therefore, for achieving optimum utilization of scarce capital investment in building, cost reduc--tion is of vital importance to national economy.

The cost of building construction has been rising steeply due to inflation, which has resulted in heavy burden on economy. For the evolution of a low-cost house a breakdown of the cost of the materials and labour of an average house is important. An analysis of cost, based on several housing scheme is given in Table-1.

TABLE-1:BREAKDOWN OF THE COST OF AN AVERAGE HOUSE.

Sr.No.	Details	Percent(%)
1.	Materials	55
2.	Labour	15
3.	Land	20
4.	Architects fees, overhead charges & constructor's profit	10
	Total	100

The first two items of Table-1 form the bulk of the cost of a house, and therefore require our serious considera-tion for the purpose of reducing the cost

of construction. It will be further seen from Table-2 that from the percentage cost of the major items of a conventional type of house that the three main items, responsible for over 70% of the total expenditure, are the walls, the roof and the doors and windows. It is therefore quite clear that the reduction in cost

TABLE-2 PERCENTAGE COST OF THE MAJOR ITEMS OF A CONVENTIONAL HOUSE

Items	Percent(%)
1. Foundation	6.0
2. Basement & Plinth masonary	10.0
3. Superstructure masonary	18.1
4. Doors, windows etc.	23.5
5. Lintels,Sills,Sunshades, Column etc.	4.5
6. Floors & Roof	17.8
7. Stairs	2.0
8. Flooring	5.8
9. Plaster & Finishes	9.3
10. Sundries	3.0
	100.0

of any dwelling unit would largely depend on economical use of building materials and use of locally available materials in preference to scarce and costly materials.

In the name of durability, the relatively affluent section of the rural population has of late started using to a great extent cement and steel, many items out of proportion. As a nation starving for its development it should be our policy to see that use of cement and steel where it can be substituted should be discouraged so that the pace of develo--pment of the nation does not get retarded for lack of cement and steel. It is to this end, apart from the cost reduction, necessary, to encourage the use of traditional materials or materials which require smaller financial and infra--structural resources and are labour intensive.

Shortage of building materials is another factor which the nation faces often. The Government is very much concerned with the housing shortages particularly for the Economically Weaker Section (EWS) of the society and if the benefits of the independence and prosperity are to reach the poorest of poor, it is solemn duty of engineers to look for material substitution and to play a leading role in conserving scarce materials.

ROLE OF BUILDING MATERIALS IN COST REDUCTION

The use of traditional building materials and construction practices has become rather costly and not very advantageous on account of one or more of the reasons viz:(i) Heavy increase in the price of materials, (ii) Lack of economy in struc-tural design, (iii) Slow and laborious process of construction & (iv) Lack of durability, expensive maintenance.

The three items of house construction in which it is possible to effect substantial economy by adopting alternative forms of construction are the walls, the roof and the doors and windows. These three items in a tradi--tional house account for more than 70% of the total expenditure on it. Therefore, while selecting building materials for house construction, as far as possible locally available materials which are cheap and do not require transportation should be used. The use of clay with good binding property and lime can be tried in place of scarce cement. For steel replacement, the use of bamboo because of its good tensile property has resulted in a major cost reduction.

Low Cost Construction Materials:

Ferrocement:The name 'Ferrocement' implies the combination of ferrous products with cement and can be considered as a special form of reinfor--ced concrete. The greatest factors lead--ing to the acceptence of ferrocement are:(i) It's basic raw materials are readily available in our country.

(ii) It can be prefabricated into any desired shape and adopted to environmental and traditional customs of the country.

(iii) The skills for ferrocement con--struction can be acquired easily.

(iv) Heavy plants and machinery are not required for ferrocement construction.

(v) No maintenance is required.

(vi) It can be repaired easily.

(vii) It is suitable for mass produc--tion and construction on self-help basis.

(viii) Septic tanks for ferrocement offer the best sewage disposal system.

Rice Husk Ash Cement (RHAC): Rice husk cement is made by mixing lime with the ash produced by burning rice husk.The ash has a high silica content together with a little carbon. Under suitable burning conditions, the structure of silica is finely divided and amorphous. Under this conditions it can undergo chemical reaction with lime to form a stable comp--ound - calcium-silicate, which is a type of cement.

The cost of raw materials for the pro--duction of RHA cement is low. Rice husk is largely wasted and an alternative to the unwanted dumping or burning would be advantageous, specially if a useful

product could be made. Though more RHA cement is used, but even so, the price would be only about 70% of that of ordinary portland cement (OPC).

Mud:Mud is used as one of the cheapest mortars in brick work under suitable conditions. Sometimes animal dung and waste mineral oil or bituminous compounds are added to mud in order to make erosion resisting mortar upto some extent. (CBRI).

Wall Construction:

Rowlock bond Brickwork: In superstru--cture brickwork 1 cum. of single brick thick wall requires 425 bricks for English bond whereas only 290 bricks per cum. are required in rowlock bond. Hence a saving of 32 percent in the quantity of brickwork can be achieved.

1. Saving of Mortar: Only 0.13 cum.of mortar is required per cum. of rowlock bond brickwork compared to 0.25 cum. required for English bond, thereby resulting in a saving of 48% in the quantity of mortar.

2. Saving in Plastering: As both the faces of rowlock bond brickwork can be kept in plumb and as such 15 mm thick plastering can be replaced by 12 mm thick plastering. This results in a saving of 16 percent of the quantity of mortar.

3. Saving in Foundation and Earthwork: As in Rowlock bond brickwork load tran--sferred to the foundation is reduced by 25% compared to English bond, the loading in the base gets reduced by 13% which enables in reduction of foundation width and consequent reduction in qua--ntity of PCC and earthwork in case of load bearing structure.

Stone Work:Instead of brickwork which need plastering and pointing on eitherside and is also energy consuming (bricks entail the burning process, coal, cement) houses can be made of stone-slabs, where stones are locally available. Numbers of joints are reduced. Stone is not plastered but it is exposed. There is hardly 10% energy consumption and thus a 40% cost reduction.

In Karnataka Hasan Project for low cost housing has totally followed above techni--que. It is accepted by HUDCO-Karnataka. In this project stone slabs were used. Granite stones which are durable and rugged, costs Rs.48.40 per Sq.m. and in large scale it costs only Rs.37.65 per Sq.m.

Flooring/Roofing:

Theconventional method of flooring/roofing are more expensive, time consuming and involve a lot of shuttering in the form of labour and material. The shuttering in the form of labour and material. The shuttering used is susceptible to damage and it's availability in bulk is progressively getting reduced in the market with increasing construction. To reduce the cost labour intensive schemes should be preferred.

Brick-flooring (plastered) can be used as it is cheaper than conventional methods of flooring. After preparing the subgrade bricks are laid on 12mm thick mortar bed on their edge in such a manner that all the joints are full of mortar. Before plastering the joints are raked to a depth of about 15mm. It is then flushed with cement slurry. It is durable and hard, easily repai--rable and cheaper than cement concrete, tiled flooring and wooden.

Broken bricks and over-burnt bricks which are cheaply available can be also used in making floors. First the subgrade is prepared by ramming and levelling. Broken bricks of size 20-30 mm are mixed with loan cement mortar and laid on 10-12 mm thick mortar bed and rammed. It is then plastered and flushed with rich cement slurry. It is very cheap depending upon availa--bility. It is hard, durable and easily repairable.

CBRI has proposed many alternatives to flooring/roofing for mass housing. Some of them are as follows:

(i) Precast R.C.C. Planks and Joists for Floors/Roofs: Precast planks and joists scheme results in a saving of 25-30 percent in concrete, 30-50 percent in reinforcement and 25-30 percent in overall cost. More than 20,000 houses have been constructed in different parts using this technique.

(ii) Prefab Brick Panels and Joists for Floors/Roofs: This technique is ideally suited for construction of semi-permanent and permanent houses in rural and semi-urban area. This scheme results in saving of 25-30 percent in concrete, 30-40 percent in reinforcement and 25-35 percent in overall cost.

Doors and Windows:

Use of readymade doors and windows with cheap treated wood is found eco--nomical and reduces time of execution and reduction in cost. Steel windows are found cheaper than wooden windows. But for low cost houses cement/brick jally can be substituted provided the climatic conditions are suitable. Instead of wooden shutters ferrocement shutters

have also been tried as substitute. The shutters have been made both in double and single leaf configuration and are giving satisfactory services. The cost of these shutter is also equivalent to seasoned country-wood shutter.

Precast reinforced concrete frames are now becoming increasingly popular espe--cially for low cost houses. They are durable fire-proof and are not affected by white ants and weather conditions, they also do not require periodical maintenance. Such frame can be made of any design in simple moulds and can be economically mass-produced.

Sanitary Units:

Plastics are most versatile among the new building materials and are bound to play a very important role in reducing overall cost of housing. Plastic pipes for water supply, replacement of copper fitting with PVC syphon for automatic urinals, complete replacement of chromium plated flushing system for urinals with PVC piping system, use of plastic water storage overhead tanks in place of conventional RCC, AC, GI tanks, devel--opment and use of FRP squatting pans and traps for hand pourflush latrins etc. has gained importance.

Installation of plastic pipes instead of metal pipes for water supply including plumbing causes 20 percent to 40 percent saving in cost. The use of plastic bib cock has also grown to the extent that at present over one million bib cocks are produced thus saving about 250 tonnes of brass every year inspite of their being about 1/5th in cost as compared to brass taps. The introduction of plastic overhead water storage tanks has installed confidence among the users as these do not corrode. GRP squatting pans are being used in place of ceramics because of their low cost (about 30 percent less) and satisfactory performance.

In addition, energy required for the pro--duction of plastic products is 30 percent to 70 percent less than the energy required for production of their conven--tional counter parts.

TABLE-3:LATEST PRICE LIST FOR PVC AND G.I. PIPES

Diameter mm	Cost of PVC Pipes (Rs.)	Cost of GI Pipes (Rs.)
20	4.55	24.50
25	6.00	34.00
32	9.50	42.00

PVC flush pipes and bends 40mm in dia--meter costs Rs.15.00 whereas G.I. pipes costs Rs.54.00.

CONCLUSION:

Various alternative building materials which has been discussed in this paper for lowering the overall cost of constr--uction have the following advantages:

(i) R.H.A. cement can be one of the cheapest construction material as rice production is very high.

(ii) Rowlock bond makes saving in terms of money and material. If stones are locally available,they can be used beneficially.

(iii) Cement/brick jelly can be effect--ively used instead of conventional doors and windows.

(iv) PVC sanitary components has gained popularity due to it's various advantages over conventional units.

Some new areas of research in building materials that meant attention are super--plasticizers, polymer concrete, composite panels, fibre reinforced concrete, light weight metal alloys, anti-corrosive treat--ments and durability of building materials. The tools of modern science & technology have so far been applied very little to improve the performance of agro-forest materials which are used by milions of our people in rural areas. A lot more needs to be done by providing decent and inexpensive shelters for masses using renewable plant based materials and agro-industrial wastes by developing durable, low-cost and low-energy building materials.

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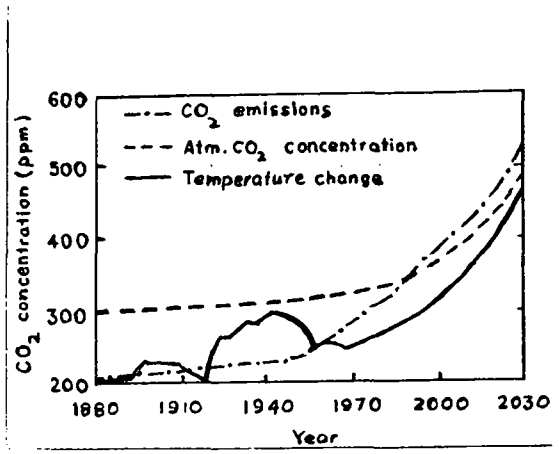
Urban planning and carbon budgeting

Dr N K Upadhyay and Mrs P Upadhyay

The civilization in the 20th century has seen many developments, revolutions and technological innovations. The cities have developed as a result of the changes from nomedic to agriculture to industrial and finally to information societies. Each society is a mile stone of civilization but has also fallouts creating problems for civilization and nature.

The urban development initially have created many civic and administrative problems but in the recent years it has thrown light on many other problems, which are of local origin but have global importance. The urban planner have to consider, these challenges faced, in the planning.

A city from environmental or ecological point of view is a fabricated ecosystem, it is creating more problems or stresses than solving them. "Pollution" is a word very common now but has a recent origin. It is an outcome of urban-industrial complex and due to lac of holistic planning in part of city planners. The "greenhouse effect" is one of them created locally but has global importance, it is thretening the very existance of many cities and countries of the world. It has been found that increased carbon dioxide in atmosphere produces a warning of earth's surface and the lower atmosphere. The warning of lower atmosphere is due to the increased absorption of long wave radiation from the surface, from clouds and increased downward emission from the CO_2 in the atmosphere. The doubling of atmospheric CO_2 concentration would lead to net heating of ocean, and land, by a global average of 4W/m2 or it will raise the global temperature from 1.7 to 4.5 degree centigrade. This in turn will melt the polar ice cap and mountain ice cover, the sea level will rise 1 to 2 meter, innundating several cities, changing contour of countries and some countries like Malta and Maldives will be under water. This will further change the agroclimate leading to socioeconomic and political problems globally. The figure indicates the CO_2 concentration in last 100 years and projection for the future.



Carbon dioxide emissions, atmospheric concentration and temperature change [computed]. Source E.S.P. 1981

It clearly indicates that there is a positive increases of atmospheric CO_2 in last 30 years. The increase is due to fossil fuel burning by and for urban-industrial complexes all over the world, the rate of deforestation and burning of forests in different developing countries.

On the global scale, the reservoir of carbon are atmosphere, ocean, biosphere and lithosphere. The transfer between Carbon (CO_2) source and sink (reservoir) constitutes the "Carbon Cycle". The impact of urban-industrial complex is more carbon-di-oxide than needed by "Carbon Cycle" and the extra is getting deposited in atmosphere causing green house effect. It is for this reason urban and industrial planners are supposed to concentrate on planning of "Carbon Cycle" in their local complexes.

Cities are developing due to demographic, political and economic pressures. The increase of carbon dioxide, on one hand, is due to developmental activities and pressure, on the other hand, due to deforestation carbon sinks are getting reduced. It has been projected that annual net release of carbon due to tropical deforestation and soil deterioration in 1977

amounted to 1.7 - 3.9 x 10^{15} g carbon in atmosphere. It has been estimated that potential sink for atmosphere carbon dioxide in the land biota is about 0.5 - 2.8 x 10^{15} g carbon. Thus, from ecological point, it is clear that carbon cycle is not complete or balanced and addition of CO_2 to atmosphere by men's activities exceeds then removed.

The increase in carbon dioxide need not have deterious effects. For plants the increased carbon means :-

- increased net photosynthesis.
- changed leaf area and leaf structure.
- changed canopy shape.
- changed pattern of photosynthesis allocation.
- increased water used efficiency.
- increased tolerance to toxic atmospheric gases.
- changed root shoot ratio.
- changed dates in flowering, seeding, etc. etc.

The urban and industrial development is essential for the growth, the co-ordination can be maintained by the anthropogenic CO_2 sources and development of the sink of carbon thus maintaining carbon cycling locally and reducing greenhouse effect globally.

The arthropogenic source of CO_2 are house, small and large industries, automobiles and the city slums. A variety of measures can be adapted to present, control or ameliorate CO_2 induced climatic changes. The planners are to help in local level reduction in use of fuel, collection, disposal and storage of CO_2. The carbon budgeting is needed for each local situation, which requires various strategies in part of urban planners and industrialists. However in this paper we are concentrating an urban house and town planning.

There are various ways by which emission of CO_2, CO, SO_2 etc. can be controlled in house but the adaptibility of communities is an important factor. Domestic carbon budgeting involves lesser release of CO_2 during cooking/heating process, to meet with that there are smokless ovens, stoves, but they are not in use, as the urban kitchens have not been planned to install them. In developing and underdeveloped countries the main cooking fuel is not gas or electricity but coal, charcoal, wood or dry leaves, all of these produce carbon-di-oxide and add 50-60% of atmospheric carbon dioxide in most of the Indian cities. The smokeless devices are not accepted even if given free, because their kitchen is not built to accommodate them. Some is true with solar cookers.

Therefore to reduce the carbon load of domestic origin a new approach is needed in the layout of house and kitchen. For the emission from automobiles strict traffic regulation are required and incentives are needed for fuel efficient engines.

The other strategies the urban planners have to think is with regard to the development of carbon sinks, that can use the carbon of atmosphere. The two simplest way are, to develope green cover in cities by planting trees in every open space, even for a shorter period, the tree plantation should not be aimed for timber but as the sink of carbon also the development of parks and green fields. The other is the development of lakes and ponds for the recreational purpose which lowers the local temperature of the cities and also act as carbon sink. Both of lthem can act as sink of carbon. Therefore with the development of carbon source if carbon sinks are planned then the carbon cycling will be completed in the local urban environment. This is essential for sustained growth and development.

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Assisted self-help housing

Alistair Wray

Self-help housing: the concept

Necessity and the lack of affordable housing alternatives mean that poor families frequently are obliged to construct the basic shelter they need themselves using salvaged materials and a great deal of ingenuity. These houses are gradually extended and improved as money becomes available and as the security of occupation increases. Formal housing projects, such as sites and services schemes, have sought to channel these activities in order to provide affordable housing to low income groups with the provision of materials or loans for materials and technical assistance to enable families to organise for themselves the construction of their houses on serviced lots. Between these two extremes there are numerous interesting examples of organisations intervening to varying degrees to assist families in constructing or upgrading their houses.

Self-help housing projects have important financial advantages. The cost of improved housing is reduced which compensates for a lack of savings and earnings capacity; it reduces loan repayments; and increases the capacity of the housing sector by producing a greater volume per unit invested. Socially, these projects encourage community and individual development and self-respect; create commitments and the acceptance of responsibilities; and provide a framework for mobilising human resources and improving the quality of life. Carefully targetted assistance can also provide valuable educational advantages. The technical training given to house-builders provides semi-qualified personnel for the construction industry, while the associated social training assists in the formation and organisation of strong community groups, the implementation of further improvement projects, and the development of individuals who are conscious and responsible for their own well-being.

Two distinct mechanisms are employed in self-help housing schemes. The construction of houses may be based either on the individual efforts and initiatives of the future occupants (own initiative) or the work may be carried out by organised groups of families who assist each other reciprocally in the construction of their houses (mutual assistance). The second method, while more difficult to organise, provides greater community benefit when successful and also offers more scope to undertake other related improvements such as infrastructure or community facilities.

The problems

Whilst self-help housing projects have come into widespread use the concept is not without its problems. It is essentially a slow construction process and allowance has to be made for this if the advantages of the concept are not to be lost. Schemes that involve a very large initial investment in infrastructure create substantial financing charges if plots are not occupied and loans taken up quickly. A considerable financial burden is placed on the beneficiary families if they are required to service materials loans well before the completion of their house. In one form or another the financing of the initial investment has to be covered and a long drawn out construction phase can easily offset the cost advantages of the self-help process.

In many self-help schemes the quality of the finished product is poor or variable and this can create disillusions with the project and an unwillingness to make the loan repayments. Difficulties can result because beneficiaries feel that the

materials or techniques proposed for these schemes are inferior or even defective. They may also feel that they have done all the hard work themselves and resent the need to made loan repayments.

Professionals often have a confused perception of the requirements of self-help housing schemes and look to labour intensive, low skill techniques which often lengthen the construction period unduly. The objective should be to make the construction task as efficient and quick as possible and to an appropriate quality, without losing the advantages of the self-help process, bearing in mind the numerous tasks and skills needed for successful house and infrastructure construction. A readiness is required to accept both local materials and mass produced products; modern technologies and labour intensive approaches, and combine them in the most appropriate way for a particular situation. The development of a strong community group to undertake self-help work and the identification of their needs and priorities is fundamental to the success of this type of project; however a sense of frustration and the poor performance on many self-help housing projects often stems from a failure to adopt suitable techniques that make the various tasks as efficient as possible.

By way of an illustration, the techniques used by one organisation concerned with improving the living conditions of low income families will be examined more closely.

A self-help programme in Central America

The Fundacion Promtora de Vivienda (FUPROVI) is a private non-profit making organisation which was established in Costa Rica in 1987 with the following objectives:
- contribute to improvements in the living conditions of the urban and rural poor and to the development of existing squatter settlements;
- assist low income groups in the identification of their housing and community development requirements;
- support the organisation and participation of communities in the development of housing and upgrading projects using self-help concepts, particularly that of mutual assistance.

The foundation's programme has four components:
- credit for materials for the construction or improvement of housing;
- credit for materials for minor infrastructure work and community facilities;
- provision of technical, legal and social assistance, training and supervision;
- provision of equipment and tools to assist the construction activities of the community.

The programme places as much importance on the development of sound, responsible local organisations as on physical works and the concept of participation covers all aspects of community development including identification of requirements, planning and organisation of the work and the execution and maintenance of services. It is, however,the fourth component of the programme that is of particular interest to this paper and its role in one project, Los Sauces, is examined to illustrate its application.

House construction

The Los Sauces project covers an existing settlement of 226 families living in makeshift shacks on steeply sloping ground on the outskirts of the capital, San Jose. The climate is cool due to the altitude, with a temperature range of 15C to 26C and an annual rainfall of 2,000mm. The area is seismic.

The most popular house construction is concrete blockwork walls and galvanised iron sheet roofing on a wooden frame. The materials lend themselves to self-help construction and training is given on how to tie the structure together to resist earthquake loads. In some housing projects small block making machines are set up at the site but in this case they were not able to compete on cost with the local factory produced blocks and so these were bought in. Small precast concrete slabs that fit into slotted columns are an alternative form of wall construction used on some other FUPROVI projects. These walls can easily be erected by two people, do not require skilled labour and can be completed much more quickly than conventional blockwork walls. This construction method is also up to 35 percent cheaper but in the case of

the Los Sauces project the residents still preferred the blockwork option and their decision was respected. The example illustrates the importance of realistically costing the alternatives but also accepting the wishes of the beneficiaries.

Concrete work in self-help projects can be of very variable quality and valuable materials can be wasted. Small cement mixers are available from the project field office for use by the beneficiaries and help to ensure that a correct mix is used in the concrete tie-beams and floors and in the voids in the blockwork walls. Small compactors were also available to house-builders through the project. The principle employed is to make the tasks as effective as possible.

The fabrication of wooden doors and windows by inexperienced hands can be very time-consuming, waste expensive materials and is rarely successful. In the Los Sauces project a small carpentry shop with modern equipment was set up by the foundation and two carpenters employed. Residents could order units from the shop paying for the materials and a fixed amount for labour. The results are high quality products which cost about the same as those made by self-help when one allows for the extra wastage. Residents were clearly pleased with the results and designs rapidly became personalised. The carpentry shop also began to supply items to other housing projects.

A proposal for the future is to set up a small press to make the metal junction boxes and fittings for the household electrical supply, the motivation in this case being substantial cost savings. Assistance is also given by the foundation to anyone wishing to purchase equipment and set up these types of enterprise on a permanent basis.

The plans for four basic house types are available from the foundation although residents are able to vary the designs to suit their requirements, and assistance is given by the technical staff in making these modifications. In the Los Sauces project four experienced foremen are available to assist the 226 families in the design, ordering of materials, setting out and construction tasks. Handtools and small items of equipment, as noted above, are provided by the foundation to the construction groups. The building materials are provided and delivered by FUPROVI as required and the quantities recorded and charged against each household. 15 percent of the value of the materials is added to cover the provision of all types of assistance and equipment and tools. House construction typically takes six months as against three months for contractor built housing.

Infrastructure works

The self-help approach is also used where appropriate for the provision of infrastructure. Requirements and costs are discussed with the residents and FUPROVI provides the necessary designs and negotiates the standards with the responsible authorities. The foundation supplies the basic materials and equipment and the families work in groups in the construction. A fixed sum is eventually charged to each household for the infrastructure component.

Methods of construction are again selected to make the work as efficient as possible. On the steeply sloping Los Sauces site earth-moving equipment was hired to quickly form the accessways rather than employ labour intensive methods and residents carried out the construction of the concrete footpaths and the drainage systems. The vehicular roads were originally going to be surfaced using stones, which are plentiful, set in mortar but the local municipality was persuaded to provide an asphalt surfacing once the construction work is finished. This is seen as an important gesture of support from the local government.

There is still scope for technical assistance to realise further benefits. Although not used here interlocking blockwork pavers provide an alternative form of paving which is most appropriate for self-help projects and small machines can be used to fabricate the paving blocks locally. Economies could also be made in the type of access that is provided. Although roads and footpaths only cover 19% of the site area (against a total lettable area of 62%) many of the roads with gradients of around 26% are accessible only to four wheel drive vehicles. Although vehicle

ownership is very low, residents at the site expressed a strong desire for vehicular access where possible believing that it would increase the value of their property. Space, materials and labour could have been saved with a greater use of footpaths and with the use of steps to break up very steep and long inclines if residents had been persuaded to accept these alternatives. Some reorientation of the layout could also have reduced gradients and made drainage easier.

The heavy rainfall and steeply sloping site has necessitated an extensive drainage system. Open semi-circular channels are being constructed by the residents. An important innovation here is the the construction of pre-cast concrete channel sections on site. FUPROVI assisted in the local fabrication of a machine (vertical hydraulic mould) using second hand truck hyrdaulics and pump, and set up a smal casting yard at a cost of $4,500. About 100 very good quality dense concrete canal sections are produced daily by two men for use on the project and sale to other housing projects at a cost $1.4 each against $4.6 each for an inferior product from local building suppliers. This cost covers raw materials, wages for the men and a return to FUPROVI for the initial investment. Important factors are again appropriateness for self-help construction, cost effectiveness and the quality of the product. Steps in the footpaths would have aided the drainage system by permitting shallower gradients and the use of energy dissipators in the channels thus avoiding the flow high velocities in the very steep channels.

Water is obtained from a near-by stream for which each family pays a fixed charge. FUPROVI has helped the community build a small dam, slow sand filter and a 50mm transmission pipe. Individual connections are provided to the houses. FUPROVI feels that distribution pipe costs are unnecessarily high due to the need to meet the standards set by the water regulating authority regarding minimum pipe diameters, service connections and pipe cover. The same also applies to the sewerage system which is based on a conventional system using 200mm minimum diameter concrete pipes, individual house connections and flush toilets (residents at present use latrines). It is anticipated that the sewer system will eventually connect to a collector leading to a treatment plant. Despite the requirement to use conventional water supply and sewerage systems, they have been constructed satisfactorily using the self- help approach although the need to comply with inappropriate regulations has increased costs substantially.

A more flexible attitude has been displayed by the electricity distribution company which has designed and installed a low cost system with limited help from the community in tasks such as pole location and erection. Only the cost of materials (including street lights) are to be charged to the project. Bulk meters are used at present as the basis for paying for electricity consumed, with a committee responsible for collecting the fees and paying the bills. Residents are however requesting that individual meters be installed eventually.

Financial considerations

The loan to residents covers the purchase of the land, legal costs, a fixed sum for infrastructure and the cost of materials used in the house construction plus 15% for technical assistance. During the construction period the financing is provided by the foundation from its own funds at no interest and only secured against the materials delivered. Once houses are completed the loans are purchased by the housing banking system and converted to long term (15 year) loans secured against the property. The same system applies for new house construction and improvements and implies that the finished product must be adequate to guarantee the loan and that the household will eventually qualify for a clean land title and a mortgage. The FUPROVI funds are subsequently applied to other projects although they do require periodic replenishment.

Conclusions

This project has been highlighted to illustrate the different and varied ways in which technical assistance can aid self-help housing and infrastructure projects, and stress the importance of embracing a mix of different methods and technologies

tailored to make the construction tasks as efficient as possible, while not losing the advantages of the self-help approach. This necessitates looking beyond purely labour intensive, low skill activities and identifying where equipment, local fabrication and mass-produced products can be beneficially employed. The quality and durability of the finished project is important not only to satisfy long term financing requirements but also to satisfy the aspirations of the householders and ultimately the success of the scheme. The project illustrates how building regulations often present difficulties and unduly increase costs (water supply and sewerage components), and the importance of low cost financing during the construction period.

Finally, the paper has concentrated on the technical aspects of assistance but recognises and must draw attention to the fundamental importance of involving, developing, strengthening and motivating the community groups when embarking on this type of project if the objectives are to be realised.

While the author is most grateful to the staff of FUPROVI for providing much information and sharing their practical experience with him, the comments and opinions expressed in this paper are those of the author alone.

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Infrastructure for low-income communities
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PLENARY SESSION 2
Urban infrastructure

Discussion on Papers

URBAN INFRASTRUCTURE

Chairperson:
Mr R A Boydell World Bank

Co-chairperson:
Prof K V Srinivasan
RCUES Osmania University
Hyderabad

Papers presented:

Dr A P COTTON & R W A FRANCEYS
Optimizing infrastructure.

Dr C FUREDY
Women and solid wastes in poor communities.

F A KHAN
Low income housing project: Peshawar.

E O MAIRURA & G E NYANGERI
Site conditions in infrastructure development.

Mrs A D D PATHIRAGE
Sites and services programmes in Sri Lanka.

Dr K N RAMAMURTHY
Slum upgrading programme in Tamilnadu.

P C SHAH, Prof M M TAMAKUWALA, Prof N C SHAH & C M DESAI
Housing costs and appropriate building materials.

Dr N K UPADHYAY & Mrs P UPADHYAY
Urban planning and carbon budgeting.

A G WRAY
Assisted self-help housing.

DISCUSSION

Dr A P COTTON & R W A FRANCEYS

1. Mr JAIN (Engineering Consultant, Jaipur) asked about the effect of septic tanks wastes on groundwater. He commented that septic tanks built for individual houses would invariably result in the tanks being built within 50 feet (15 metres) of each other. Mr JAIN enquired as to how this would affect the groundwater, and whether the groundwater would be safe for use as drinking water.

2. Mr FRANCEYS replied that when latrines or soakage pits are constructed at intervals of 10 metres or less it is reasonable to assume that the groundwater will be polluted around the housing site. It is, however, more economic to pipe clean water into a housing site (accepting that hand-dug wells cannot be used) than it is to pipe waste water out.

3. Mr JAIN (Engineering Consultant, Jaipur) also wanted to know how much extra water would be needed if pour-flush latrines were to be constructed and water were to be used for essential sanitation and personal hygiene.

4. Mr FRANCEYS commented that the water use per flush for a pour-flush latrine depended upon the design of the pan, the trap gradient and the length of pipe to the soak pit. One litre may be adequate if sufficient force is used to flush the system. Poorly designed systems may require five litres per flush.

5. Mr SPEETS (Water Co-ordinator, Royal Netherlands Embassy) wished to know whether the technology of small-bore sewer systems had been incorporated or considered in the cost figures for sanitation in the 'sewerage' option in order to reduce the cost. If so, Mr SPEETS asked what the cost effects were.

6. In reply, Mr FRANCEYS stated that the costs used in the study took account of possible benefits to be obtained from the various approaches now being investigated for reduced cost sewerage. However all methods of sewerage involve considerable recurrent cost implications for increased water supply necessary to transport the excreta. This water cost is more significant than any small savings in capital cost.

7. Mr MOHANTY (State Sanitation Cell, Orissa) asked whether any change to the assumed conventional rate of water consumption was required while the water supply system was being optimised.

8. Mr FRANCEYS answered that water consumption in the optimisation model is fixed for ordinary domestic use, but is increased when sewerage is used for sanitation.

9. Dr JOSHI (Department of Housing and Urban Development, Nepal) commented that the analysis seemed to be based on a 'hit and miss' method, considering individual cases for different options, rather than using optimization techniques. He asked the authors to kindly explain the sensitivity of the result in relation to the problem of defining an option. As an example, Dr JOSHI asked how well a

condition such as 'conventional high-level standard' could be quantified or simulated to a real situation encountered.

10. In answer, Mr FRANCEYS said that the spreadsheet model investigated all possible options and combinations of options to determine least costs. It did not use a computerized optimization technique. Because of the volume of data generated, the results have been simplified for the conference presentation, resulting in the four options detailed. With regard to sensitivity, the sanitation choice overwhelmed all other choices.

11. Mr PRADHAN PRATULLA (Ministry of Housing and Physical Planning, Nepal) noted that the choice between alternative options appeared to be purely technical. He asked how beneficiaries could participate in the process of choosing alternatives.

12. Prof RAM PRASAD (Sri Venkateswara University College of Engineering, Tirupathi) asked a similar question; enquiring of the authors how they would proceed to identify the relation between the available technology options and the optimal technology option, taking account of both cost and the traditional acceptance.

13. Replying to both questions, Mr FRANCEYS said that the study focussed on technical choices and costs. Beneficiaries can only make realistic choices once they know the cost implications of the alternatives available.

Dr C FUREDY

14. Dr DAS (UNICEF, Calcutta) expressed concern about hygiene, asking the author whether she agreed that allowing people access to pick wastes from garbage dumps (as a necessity to support the poor, to meet their needs or to have employment) goes against the principle of cleanliness, hygiene and environmental sanitation. He then asked which the author considered to be more important: improving hygiene for all or using wastes to support the needs of the poor without any concern for hygiene.

15. Dr FUREDY acknowledged the fundamental conflict. The only solution would be to keep valuable wastes separate and clean, and to promote door-to-door collection of clean household, office, institutional and hospital wastes. In addition, washing and health care facilities should be available at all transfer stations and dumps. It is not possible to keep poor people away from valuable goods that are free. Scavenging must therefore be somehow made safer. Dr FUREDY added that she does not promote the shift of waste gathering to dumps, but rather the contrary. Her opinion is that recyclable materials should be separated before they are mixed and dumped. All concerned about the lives of the poor should show concern for matters of hygiene.

16. Mr SHRESTA (Rural Water Supply and Sanitation Project, Rupendehi, Nepal) was also concerned about the health hazards to which women are exposed when picking over waste materials. He asked what measures might be taken or considered to protect the women for whom the waste provides a living.

17. In reply, Dr FUREDY stated that the health risks were not fully understood, because no thorough studies have been undertaken. Pickers at garbage dumps are known to have higher than normal rates of parasitic infestation, diarrhoeal diseases, etc.: and that they also suffer from cuts, rat and snake bites, influenza and backache. No studies have been made of the health of children who scavenge on dumps. There may be dangers from dust and handling of wastes, even away from garbage dumps. Two relevant research studies are being made in Asia. Prof Kumar Nath (All India Institute of Hygiene and Public Health, Calcutta) obtained WHO support to study garbage pickers at a dump. The results have not yet been released. In Bangkok, Ms Nippapon Kungskulniti has looked at the health of garbage pickers at On Nooch dump. The results of this study are for a doctoral thesis at the University of Hawaii, and the thesis is not yet complete. Dr FUREDY stated that the country best placed to study the health of government waste sorters and workers (not on dumps) is China. The workers in the waste recovery companies of large cities receive medical treatment and a medical check twice a year. Health records are preserved for twenty years. Dr FUREDY hopes to initiate some work on this subject in China. When considering preventative methods, the total living conditions of the people need to be studied. Issue of boots and gloves will achieve nothing if hands and feet are already soiled, and if there is no opportunity to wash and change after working with wastes. An integrated improvement of both working and living conditions is needed.

18. Ms DAW (National Association of Water Resources Development Agencies, Pune) commented that possible interventions can be attempted if it is accepted that a group of people will earn their living by picking over solid wastes. The people concerned normally demarcate the areas for picking and follow a regular routine in visiting the dump every three or four days. Households could be encouraged to segregate dry refuse for issue to the pickers (both men and women); and the informal organisation of the pickers could be improved.

19. On the first suggestion, Dr FUREDY agreed that separation of wastes 'at source' is the best solution, and this method is widely used for certain materials such as newspapers, bottles and old clothes. The next stage is to keep wet wastes separate. This has been attempted in a few places, but the projects were not well-designed. Municipal councils have not acted on suggestions for facilitating clean picking, but Dr FUREDY hopes that opinions will change. With reference to organising the pickers, Dr FUREDY reported that SEWA (Ahmedabad) has made progress with organising co-operatives of waste gatherers. Research and support are needed to further these ideas.

F A KHAN

20. Mr RAGHAVAIAH (Andhra Pradesh State Housing Council) asked what action the author could suggest to save the wood from forests by using substitute materials in building construction activities. Saving wood would save the forests and, in turn, the planet.

21. Mr KHAN replied that wood has been a traditional component in building industries, but that alternative building materials should now be considered. Such action could, as the question suggested, contribute to saving the forests and so to help to save the planet.

22. Miss ZACHARIAH (Socio-economic Unit, Kerala Water Authority) asked whether local materials were used for the various technologies employed, and whether local people and beneficiaries were involved in their production.

23. Mr KHAN replied that the materials were local, using a mixture of tried and tested technologies, both local and from elsewhere. Local people were involved to the extent that the unskilled labour input was provided by the beneficiaries.

E O MAIRURA & G E NYANGERI

24. Mr MUKHOPADHYAY (Water Supply Division, Calcutta Municipal Corporation) noted that the sand filter trench would tend to contaminate the groundwater. He asked whether any precautions had been considered to prevent such contamination.

25. Mr MAIRURA replied that the issue of contamination does not occur because the quality of the effluent released from a sand-filter trench is comparable, if not superior, to that from a conventional sewage treatment works. In any case, the receiving water-body (the Nairobi River) is already heavily polluted upstream as it passes through the central commercial areas of Nairobi City. Finally, it is not planned to use the Nairobi River as a source of water supply.

26. Mr MUKHOPADHYAY (Water Supply Division, Calcutta Municipal Corporation) also enquired as to whether serious consideration had been given to afforestation in the catchment areas of the river in order to prevent silt deposition on the river bed.

27. In answer, Mr MAIRURA stated that measures, including afforestation, are already being undertaken by other central government agencies in Kenya to prevent soil erosion.

28. Dr FUREDY (York University, Toronto, Canada) expressed concern about the use of eucalyptus trees. She asked whether careful consideration had been given to the many problems experienced from planting eucalyptus trees in Hawaii, India and Israel; and whether published material had been studied. When fully grown, the trees suck up deep ground water, not surface water, so affecting the basic water supply.

29. Mr MAIRURA confirmed that the negative impacts of the eucalyptus on water resource catchment areas and areas of agricultural potential are well-known in Kenya. For this reason, the government has ordered the removal of such trees beside river courses. For the proposed project in urban areas, the isolated plantations will be supported by flows of sullage effluent. It is planned that the rivers flowing through urban areas should not be used as sources of water supply, and the effects on basic water supplies therefore do not arise.

30. Miss ZACHARIAH (Socio-economic Unit, Kerala Water Authority) wished to know what action would be taken in situations where people have no option but to stay in an 'unfavourable' area.

31. In reply, Mr MAIRURA emphasised that the proposed model recognises that a solution to poor infrastructure among the unplanned low-income settlements must be found within the sites where these settlements are located. The paper therefore proposes development of a technology that maximises the utility of the wasteland space along the floodplain on which the case study settlement is located. Mr MAIRURA also noted that the proposed model is aimed at meeting as many health and environmental improvement objectives as possible through maximising available resources at minimum cost.

Mrs A D D PATHIRAGE

32. Mr SOMESHWARA RAO (Executive Engineer, Government of Andhra Pradesh, Hyderabad) asked for detailed reasons for the stated failure of housing programmes in Sri Lanka prior to 1984.

33. The reasons for failure were given by Mrs PATHIRAGE, who stated that before 1984 all housing programmes in Sri Lanka were conducted by the government without any involvement from the beneficiaries. The government:
- decided the location;
- prepared house and infrastructure plans:
- constructed the houses and provided the infrastructure;
- selected the beneficiaries; and
- fixed the selling prices.

The beneficiaries therefore had no choice, and the housing programmes were not very successful.

34. Miss KATTICAREN (Netherlands Assisted Project Office, Hyderabad) commented that her understanding of a sites and services programme involved developing a completely new site for communities having various levels of income. She wished to know how and when the Community Development Council could begin to function.

35. Mrs PATHIRAGE answered that the Community Development Council starts to operate from the very beginning of the programme. The council is composed of representatives of the beneficiaries, and they work together with Housing Development Authority officers in all aspects related to the programme, such as:
- site selection;
- beneficiary selection;
- housing loans;
- design of infrastructure;
- construction;
- maintenance; and
- cost recovery.

Dr K N RAMAMURTHY

36. Mr JOHN (Socio-economic Unit, Kerala Water Authority) asked for clarification of the author's reference to multi-storey housing schemes deteriorating into multi-storey slums. Mr JOHN wished to know whether this comment implied that multi-storey housing schemes should be discouraged. Populations in European countries are not increasing as fast as in Asian countries. When land is limited and individual houses are preferred for cultural, social or other reasons, there is a danger that house construction would result in loss of trees and fertile agricultural land, and large areas requiring infrastructure.

37. Dr RAMAMURTHY replied that, in addition to quantitative aspects of housing needs, qualitative aspects are equally important. During planning, it is necessary to identify such details as how people want to live, how they live at present, and the effect of social characteristics on their lives. People living in muti-storey tenements are psychologically disturbed by lack of privacy and the threat of fire hazards. In most countries, including India, construction of high-rise housing developments has shown rapid signs of environmental degradation, and schemes have suffered total rejection by the people. A promising potential solution is to introduce partial industrialized systems using medium rise housing developments based on a support-infill concept where the residents play a part in planning interior spaces to suit their needs.

P C SHAH, Prof M M TAMAKUWALA, Prof N C SHAH & C M DESAI

38. A delegate from Nepal commented that the costs of building materials had been mentioned, but the difference between housing costs and building costs was not clear. Loan conditions and costs of infrastructure also need to be considered.

39. Miss DESAI agreed that finance needs to be considered for a full housing scheme. The paper only considered costs of materials.

Dr N K UPADHYAY & Mrs P UPADHYAY

40. Another delegate from Nepal commented that the paper seemed to imply that planners lack concern for the environment.

41. In reply, Dr UPADHYAY felt that the delegate had rather missed the point of the paper. There is a need to balance the use of carbon with sinks for carbon. Planners need to consider many subjects, including environmental issues.

A G WRAY

42. A delegate from Nepal asked for an explanation of the differences between options for financing self-help housing projects.

43. In answer to the question, Mr WRAY said that conventional house financing is through long-term loans secured against the house, with the interest starting as soon as the loan is withdrawn. Due to the need to purchase building materials and the time that passes before a house is completed and occupied, different financing is necessary for self-help projects. In the example used in the paper, the foundation provided interest-free funds for materials, equipment hire, etc. Once the house was complete and occupied, these loans were taken up by the conventional housing banks, which released the foundation funds for other projects.

GENERAL

44. Mr RAJADURAI MICHAEL (WaterAid, Tiruchirapally, India) made a general comment, that cost recovery is not an issue with people struggling to feed themselves. In India, rural housing has, in the past, been based on assigning house sites or giving permanent tenancy to sites owned by landlords, and assisting people to buy roofing materials. The people constructed their own mud walls. The cash cost for such a house was only Rs 300. Now brick houses costing Rs 9000. are planned. Agencies have become involved in false costs and cost management, so that less than 5% of the needy families will be reached. In the past, once the poor completed their homes, they were encouraged to grow trees to provide timber. They could strengthen the roof over a period of from 5 to 15 years, and renew their mud walls every year during a festival. Cement walls require cement and skilled workmen.

45. Mr RAJADURAI MICHAEL (WaterAid, Tiruchirapally, India) also made a general observation about slum improvements. He quoted an example from Madras, where multi-storey slum-clearance buildings were assigned to slum dwellers, who rented their flats out to lower middle-class families while the owners continued to live in slum conditions. If the improvement in conditions is too great, the slum dwellers attempt to take advantage. Programmes should therefore be designed to help slum dwellers improve their housing standards gradually, rather than to provide facilities significantly better than their present ones.

Dr DAS (UNICEF, Calcutta)
Ms DAW (National Association of Water Resources Development Agencies, Pune)
Miss DESAI
Mr FRANCEYS
Dr FUREDY (York University, Toronto, Canada)
Mr JAIN (Engineering Consultant, Jaipur)
Mr JOHN (Socio-economic Unit, Kerala Water Authority)
Dr JOSHI (Department of Housing and Urban Development, Nepal)
Miss KATTICAREN (Netherlands Assisted Project Office, Hyderabad)
Mr KHAN
Mr MAIRURA
Mr MOHANTY (State Sanitation Cell, Orissa)
Mr MUKHOPADHYAY (Water Supply Division, Calcutta Municipal Corporation)
Mrs PATHIRAGE
Mr SOMESHWARA RAO (Executive Engineer, Government of Andhra Pradesh, Hyderabad)
Mr PRADHAN PRATULLA (Ministry of Housing and Physical Planning, Nepal)
Mr RAGHAVAIAH (Andhra Pradesh State housing Council)
Mr RAJADURAI MICHAEL (WaterAid, Tiruchirapally, India)
Prof RAM PRASAD (Sri Venkateswara University College of Engineering, Tirupathi)
Dr RAMAMURTHY
Mr SHRESTA (Rural Water Supply and Sanitation Project, Rupendehi, Nepal)
Mr SPEETS (Water Co-ordinator, Royal Netherlands Embassy)
Dr UPADHYAY
Mr WRAY
Miss ZACHARIAH (Socio-economic Unit, Kerala Water Authority)

PLENARY SESSION 3:
Rural infrastructure

16th WEDC Conference
Infrastructure for low-income communities
Hyderabad, India 1990

Minor irrigation: access to small farmers

M Asaduzzaman

INTRODUCTION

The economy of Bangladesh is mainly based on agriculture and it will be a dominating sector in the economy for the years to come. Introduction of irrigation and the associated technologies is the prominent step initiated by the Government to change the socio-economic structure of the rural people. It has been found that only irrigation can increase agricultural production from 25 to 40% and it can be multiplied several times if the associated technologies like seed, fertilizer, pesticide, etc. could be practiced(13).

Before the introduction of lowlift pumps, traditional means of irrigation have been in use in the country. The use of groundwater for irrigation has been widely started in 1967. Its use rose sharply in 1982 when the use of lowlift pumps reached its potential capacity. However, no single system of irrigation could prove its absolute superiority over the others.

SMALL FARMERS

The farmers in Bangladesh are classified as small, medium and large, according to land holdings.(3) Small farmers hold from 0.25 to 2.49 acres; medium farmers from 2.5 to 7.49 acres; and large farmers hold over 7.5 acres. The number of farmers, area in acres and the average area under each class of farmers in Bangladesh are shown below:

Class	Number (%)	Area (acres)	Ave.acres
Small	7066000 (70%)	6573000 (29%)	0.9
Medium	2483000 (25%)	10226000 (45%)	4.1
Large	496000 (5%)	5879000 (26%)	11.8
Total	10045000	22678000	2.25

Source: Bangladesh Bureau of Statistics

This paper intends to deal with the small farmers who are the highest in number in the country and who occupies 70% of the total farmers, but holding only 29% of the available land.

MINOR IRRIGATION

In India, until 1978, minor, medium and major irrigation projects were classified as per cost of the project, i.e. less than 2.5, from 2.5 to 5.0 and above 50 million rupees, respectively. Since 1978, the above classification is based on the coverage of the commanded area such as less than 2000, from 2000 to 10000 and above 10000 hectares as minor, medium and major irrigation projects respectively (12).

However, in Bangladesh the minor irrigation projects are based on traditional water lifting devices: lowlift pumps, hand and shallow tubewells and deep tubewells (15)

TRADITIONAL WATER LIFTING DEVICES

The traditional water lifting devices such as swing basket and hinged channel and counterpoised lift can lift to a height of 2 to 6 ft. respectively from the surface of water and estimated to cover around 0.49 million hectares in the country. These are very efficient manual devices.

HAND TUBEWELL

The farmers found that the hand tubewells supplied by the Department of Public Health Engineering assisted by UNICEF for domestic purposes are equally good for irrigation. These are called MOSTI, i.e. Manually Operated Shallow Tubewell for Irrigation.

MOSTI can sustain a discharge of 9.6 imp. gallon per minute at a static suction head of 17 ft. and requires 0.05 water horse power or 38 watts(15). Much of the pumping is done by the village women and the children, having an efficiency of around 60%. Normally, a MOSTI can irrigate about 0.33 to 0.5 acres of land and presently, around 255560 MOSTIs are being used in the country (10).

ROWER PUMP AND TREADLE PUMP

These two types of pump are very recently put to use for irrigation purposes. The suction lift of rower pumps and treadle pumps are 25' and 16' respectively and the discharge is about 0.76 and 1.0 litre per second respectively, and both the pumps can be installed in combination with bamboo and PVC (11).

LOWLIFT PUMPS

Normally, a lowlift pump is a unit of a centrifugal pumps directly coupled to a diesel engine of 5 to 18 horse power and used to lift water from a river or open water surface having a discharge of one and two cusec of water working against the total head of 40 ft.(15).

SHALLOW TUBEWELL

A shallow tubewell is usually a combination of G.I. or PVC pipe of 110 to 150 ft. length, having blind pipe and strainer of 4 inch diameter each. The pumping unit consists of a centrifugal pump of capacity of 0.75 cusec discharge and is directly coupled to a diesel engine or an electric motor. The total working head of the pump is around 30 ft. and the suction lift is very effective upto 18 ft. Presently, about 250000 shallow tubewells are working in the field (10).

DEEP TUBEWELL

A deep tubewell is generally installed in a drilled hole between 150 to 300 ft. having 14 inch expanded top and 6 or 8 inch dia blind pipe and strainer. Turbine pump is set at 50 to 90 ft. depth and driven generally by diesel engine through a right angled gear having discharge between 1.2 to 2.0 cusec. About 30000 deep tubewells are working in the field. Total withdrawal of ground water equals to 12754 Mm^3 against the estimated value of 18966 Mm^3 (10).

EQUITY IN IRRIGATION

Irrigation injects a thriving resource in the rural economy of Bangladesh. But the outcome does not reflect the proportional growth of wealth of the rural people to the land they possess. The effect of irrigation on the growth of wealth depends mainly on the availability, management and distribution of irrigation equipment.

A small farmer may not have the financial back-up to possess the less costly rower pump or treadle pump of his own. Similarly, the rate of irrigation water charged or the initial payment for the purchase of a shallow tubewell makes him unable to participate in such scheme. Largely, the small farmers are not getting access to irrigation.

In practice, the large and medium farmers dominate the management of lowlift pumps and deep tubewell schemes, the inclusion of small farmers in those schemes is either by the location of the land or by good management which is rare. The study made by Quadir, Emmert, et al (1978) show that the deficit farmers become self-sufficient after being included in the scheme area. So, it is desirable to maximize the inclusion of such farmers in the potential commanded area of the above equipments.

A study of 100 deep tubewell schemes and the number of small farmers included is shown below:

No. of case study	No. of small farmers	No. of medium farmers	No. of large farmers
100	2517 (66%)	1236 (32%)	91 (2%)

It is seen that access to irrigation by small farmers is greaest provided full command area is served. The socio-economic distribution effect of different irrigation technologies such as lowlift pumps, shallow and deep tubewells are studied by Hamid, Mukharji, et al (1982), Hamid, Azharuddin, et al (1984) and both the studies showed a tendency of greater benefit for large and medium farmers than small farmers'(6).

DEEP TUBEWELL POLICY OPTION

Access of the small farmers to irrigation mainly depends on proper siting of deep tubewells. Various systems of installation and operation of deep tubewells are practiced by different organisation such as:

A. The Bangladesh Agricultural Development Corporation

This corporation has introduced initially the "rental system" of sinking and operation of deep tubewells and continued the system upto 1979-80. In this system, oil and fuel and managerial costs are borne by the farmers. After 1980, the "sale system" of sinking and operation of deep tubewells was introduced by the corporation at the desire of the donor agency. Here, presently, only formal groups can purchase deep tubewells.

According to the irrigation water rate ordinance 1983, "irrigation charge system" has been introduced in the "Barind Integrated Development Project". The realization position of "irrigation charge" was more than 90% for the last three years (1).

B. Bangladesh Water Development Board

Bangladesh Water Development Board has introduced "tax-free" system in 1964-1965 in the Thakurgaon deep tubewell project and discontinued the system of realizing water tax at the rate of 3% of the additional crop. After 1984, this water tax system was replaced by the tax system on crop basis. The Board bears the cost of energy consumed and the salary of the drainman. But the

realization position of tax is very poor and which is only 3 to 4 % (2).

In conclusion, it may be said that the donors prescribe the agricultural policies of Bangladesh and the government tries to implement such policies without counting the outcome of it.

COST OF PRODUCT

Normally, the net earning per acre of land through irrigation comes for paddy to around Tk. 2,409 (US$ 69 - conversion rate of US$1 equals Tk. 34.9) when the irrigation charge of Tk. 13,500 is considered as in the Barind Project. But for a deep tubewell under the sale programme, the same comes to Tk. 1,458 (US$ 42), after paying the initial installment of Tk. 40,000. Further, the small farmers here is forced to sell out their products just after harvest to meet the loan an other family requirements when the price level of crops remain at the lowest. Sometimes, the cost of product is lower than the cost of production. At other times, crops may fail due to mechanical problems or conflicts within the groups, bringing misery to the small farmers. The effects of such hazards can be minimized with crop insurance, price protection system or community storing facilities (2).

POLICY OF PRIVATIZATION THROUGH SALE SYSTEM

Professor M.A. Hamid described in his studies the advantages and disadvantages of both the sale and rental system of deep tubewells. He opined that the rental programme is better for productivity, distribution, net return and employment. Further, he preferred the rental system to sale system from the point of attainment of self-sufficiency in food and utilization of irrigation equipments(8).

In fact, "irrigation charge" system as used to be practiced in the Barind project is comparatively more socially acceptable, where the rate of subsidy is less and well accepted by the water users. The policy of privatization encourages the well-to-do farmers to purchase irrigation equipment and behave like water-sellers or waterlords to the small farmers and in turn, they give away to the rate of water the seller charge.

STATUS OF AGRICULTURAL CREDIT

Though agriculture is the mainstay and backbone of the economy of Bangladesh, the rate of interest on agriculture credit is 16% per annum, which is second highest to commercial lending of 18%. The interest on agriculture credit is higher than rural housing, working capital on agriculture product, small cottage industry and urban housing which are 8%, 9%, 10% and 12 to 15%, respectively, per annum (4).

It is better to impose reasonable and realistic interest on agricultural credit, so that the small farmers can participate in the credit facilities and boost up the economy of Bangladesh, instead of trapping them with non-realization of loan and cumulating the loan every year. Till 1988-1989, the amount of "Bad Loans" in the agriculture sector is about 2,35,568 million taka (US$ 6744 million). The main reason for poor recovery of agricultural loans is the accumulation of the installments which becomes beyond the financial capacity either of the individual borrower or group. In most cases, the loanee believe that these loans, or at least the interests, would be written off at some stage (7). However, very recently, (March 11, 1990), the World Bank President, Barber B. Conable in Dhaka assured farmers with more loans at low interest rates for agriculture development of Bangladesh (14).

In conclusion, it should be remembered that the small farmers are aout 70% of the total farmers of the country and no programme could be made bright and successful if these farmers do not get access to irrigation and agricultual credit.

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16th WEDC Conference

Infrastructure for low-income communities

Hyderabad, India 1990

Health, development and infrastructure

Dr Margaret Ince

INTRODUCTION

As communities and nations develop so does the level of organization and infrastructure necessary to support it. Among the factors driving development are improvements in health and well-being and, hence, survival.

In this paper the interrelationships of engineering infrastructure and health with development are considered, with particular emphasis being given to urban environments, and slums *'a dirty overcrowded district inhabited by very poor people'* (ref. 1)

HEALTH

There is a need to shift away from economic development with a dependency on curative health measures towards sustainable development, embodying promotive and preventive health measures supported by curative systems.

Curative health is essentially a technology-oriented and hospital-based system that concentrates on treating those who are already sick. This requires inputs by trained doctors and nursing staff, expensive and often rare and sparsely distributed cadre, especially in rural areas and slum communities.

Promotive health is directed at changing people's behaviour patterns, through health education and example, to prevent them becoming sick. Awareness of the transmission cycles for diseases and actions that can interrupt the cycle, if adopted, can markedly reduce disease incidence. It is, therefore, closely linked to prevention.

Preventive health is, as the name suggests, aimed at preventing people becoming sick. It embodies a variety of approaches which are outlined in figure 1. It is closely allied with promotive health and health education.

Malaria is one example of a disease for which all the methods can and may need to be used to reduce disease morbidity. For example, **chemicals** can be used to kill larval or adult mosquitoes or as prophylactics to prevent susceptible hosts becoming infected; **biological** control using fish that eat mosquito larvae can be used in open wells, swampy areas and flooded basements; **engineering** methods such as filling borrow pits, design of standposts and drainage

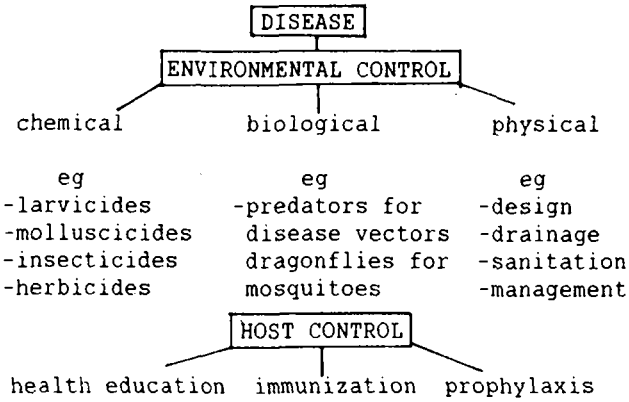

FIGURE 1. Preventive measures to interrupt disease transmission cycles.

channels (especially stormwater ones) and provision for disposal of sullage all reduce ponding and hence potential breeding sites for malaria-carrying mosquitoes.

Dracontiasis (Guinea worm infection), in contrast, is unique in that improving the quality of drinking water alone could erradicate the disease. India is one of the countries that is currently implementing a successful Guinea worm erradication programme. Using a mixture of measures, e.g. chemicals to attack the vector (*Cyclops* species), fine mesh cloth for straining drinking water, health education and provision of protected water supplies, Guinea worm in India could be eliminated by the end of 1990.

HEALTH, DEVELOPMENT AND THE ENVIRONMENT.

Health and the environment.

Mismanagement or lack of management of the earth's resources and of human domestic, agricultural and industrial wastes, together with socio-cultural determinants, affect not only human health but also cause damage, possibly irreparable, to geophysical and ecological systems in the biosphere. This paper will however concentrate on the impacts on human health; for fuller discussions of the wider issues the reader is referred to the literature (refs 2-7).

Human health - a state of complete mental, physical and social well-being, rather than solely the absence of disease - is affected by

many components in the environment. Climate and natural catastrophies, such as earthquakes, floods and hurricanes, can have dramatic effects in localized areas but it is environmental management or manipulation by humans themselves that has the greatest effect on morbidity and mortality. Water, food and shelter are essential for survival and humans have developed ways to adapt their environment to satisfy these needs. Developments have, however, been costly in human, economic and environmental terms. They have resulted in an unequal health status, most notable between the more industrialized, developed countries and the developing countries: difference also occur within countries, between the rural and urban communities.

Health and development

Global awareness of the contribution of economic development to effects such as damage to the ozone layer; greenhouse warming and the depletion of forest cover and non-renewable energy resources and their implications for human (and environmental) health is increasing. The need is to achieve a balance of economic development and engineering infrastructure against long-term health of humans and the environment.

Development plans emphasizing sustainability, particularly through community involvement, have arisen out of the need to optimize development expenditure so that it reaches an increasing percentage of the growing world population. Participation of communities necessitatess changes in programme planning to accommodate consultations and, where necessary, the strengthening or establishment of institutional infrastructure to support the current and future developments.

Experience has also shown that, for positive results on health, good planning, design and operation and maintenance are essential for any development programme. Failure to assess fully the health and socio- cultural aspects of interventions can have disasterous consequences, from the high incidences in schistosomiasis following impoundment for irrigation (ref. 8) to the non-use of a a borehole sited on 'holy' ground because of failure to consult the villagers.

Health and infrastructure

The International Drinking Water Supply and Sanitaton Decade has further raised public consciousness of relationships between health and infrastructure development, especially as regards infectious disease.

Water-related illnesses cause the deaths of approximately 25 million people per year, i.e. one death every 1.2 seconds, and the deaths of >15 children every minute from diarrhoeal disease alone. In addition, millions more are debilitated by schistosomiasis (250 millions), malaria (350 millions), trachoma (500 millions) and Bancroftian filariasis (250 millions) each year. In India alone the cost of a loss of 73 million days of production each year and the medical care involved is over US$ 1 billion. Most of these cases could be prevented by development of appropriate infrastructure.

Infrastructure development provides the opportunity, therefore, for improvement in health status through reduction in infectious disease. It also has effects on the mental and physical health status by, for instance, removing the stresses of collecting water or of living in substandard housing. It should, however be achieved by methods that conserve the environment for future generations.

A three-legged stool has been used to represent the infrastructure necessary for health and development: Sanitation, Education and Water act as the three legs, supporting health and development, the seat. The acronym for this imagery is, therefore, SEW.

Of acronyms developed at WEDC to represent more complex relationships of infrastructure to health and development, a preferred one is 'FISTE for HAND' (with apologies for the spelling). The clenched fist with its five digits represents - Financial and economic
- Institutional
- Socio-cultural
- Technical and
- Educational and environmental

infrastructure, with the hand representing
- Health
  and
- Development.

Development and Infrastructure

Sustainable development with improvements in health, can be realized through programmes that are: economically sound and capable of being supported financially by the community or government; taking into consideraton both the social and cultural preferences of those being served; aware of institutional and educational potential and select technologies appropriate to these needs, capabilities and potentials in a specific environment.

One approach commonly adopted is introducing development in stages or starting with a technology than can be readily upgraded when funds or materials become available. Pilot projects are useful tools to help communities choose from a number of possible technologies. This has proved useful in sanitation projects where the choice may be be between different latrines or possibly septic tanks and shallow sewers. Such pilot projects may also demonstrate that the alternative technology is

not only at least as efficient as conventional systems but, for the particular location, is actually a better option.

Educational infrastructure and provision of training for local in-country personnel at all levels is invaluable for project sustainability. This can range from informal health education using the media or mother and child clinics, through training on-the-job of pump attendants or community-based health workers, to formal education at national or international institutions for the implementing engineers, the medical staff or managers and administrators.

This education helps to ensure successful project implementation and subsequent operation and maintenance. It also discourages dependency on external 'experts', thus fostering the concept of self-determination and reliance.

The ethos of affordability, self-determination and sustainability parallel those of Primary Health Care (refs 9 and 10).

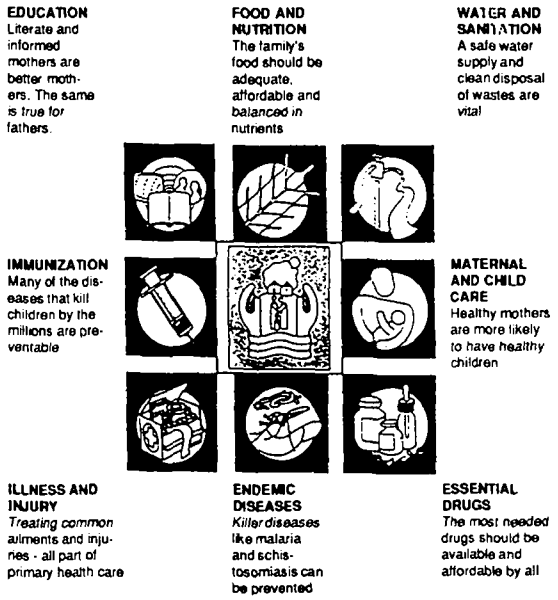

FIGURE 2. Primary Health Care.
The family unit at the centre of the figure is surrounded and protected by the compoments and the 'hands' of Primary Health Care.
Source:- adapted from Bryant (ref. 10).

To provide the necessary promotive, preventive, curative and rehabilitative services it should include the eight components illustrated in figure 2. To provide these services requires a multi-disciplinary and co-ordinated approach. This is facilitated by cross-discipline components in all training programmes, which is why WEDC courses for engineers include, among the many subjects studied, health and social science components and, correspondingly, health sector workers study technolgy and economics.

Primary Health Care (PHC) is a vital component of the campaign for Health For All by the Year 2000, both of which are well documented in ref. 10. It is also essential if the health status of the rapidly rowing urban populations is to be improved.

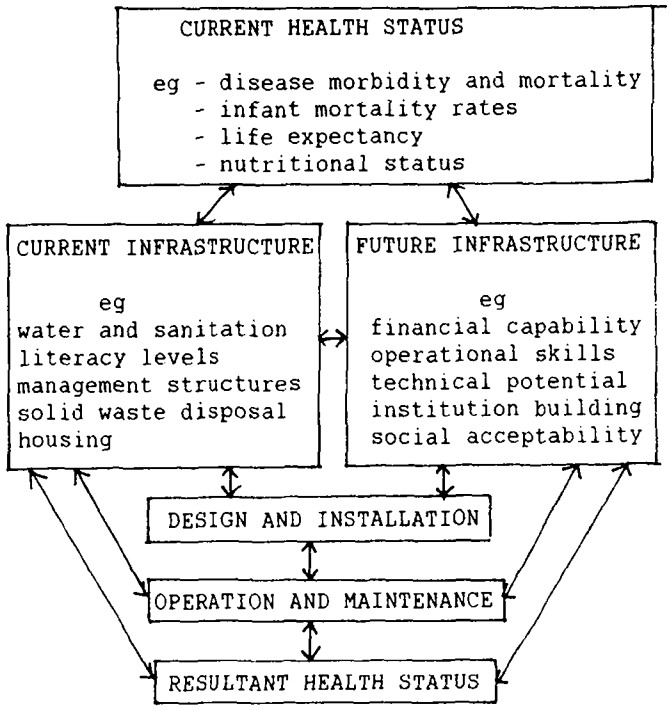

FIGURE 3. Health status: factors affecting the impact of development projects.

Figure 3 shows a simplified interaction chart or health cycle for assessing a path for improving health status. The infrastructure and additional factors indicated reflect the aims of PHC and sustainable development. The chart is akin to the project cycle.

This cycle approach can be used in rural as well as in the urban developments, including slum communities, in developing and developed countries. In developing countries, however, infectious diseases are still prevalent and a major cause of morbidity, so the impact of infrastructure development on health status is high. The health conditions in towns and cities are in the following overview of urbanization.

HEALTH IN URBAN ENVIRONMENTS

Health and urban settlements

Human contact with most positive and negative factors affecting their well-being occur in settlements. Despite the higher population and housing density than that found in rural communities, provision and access to services and amenities is, generally, greater. This is

especially true for health care facilities. In addition the movement of people in to and out of the city, as well as within it, facilitates the spread of disease to all inhabitants. With improved communications, including international travel, the spread can be rapid.

In new housing schemes, sites and services planning can incorporate the physical infrastructure to optimize health benefits (within budgetary constraints). The best schemes will also consider at the planning stages the socio-cultural patterns of future residents. In the 'old' areas of cities narrow streets and house design can make upgrading measures difficult and alternative technologies may need to be developed. The greatest problems are, however, usually associated with newer, spontaneous or unplanned settlements.

Population pressures on non-renewable resources by subsistence farmers lead to debt and the poverty trap; this forces more people out of rural areas and into towns and cities. Here, failure to keep pace with the infrastructure demands of rapid urbanization and urban growth result in population overspill from existing housing and in the establishment of slums.

The quality of housing, overcrowded conditions and lack of amenities are among factors that contribute to higher incidences and different patterns of disease in slum communities relative to other communities in the same city. Air pollution from hazardous industries and from traffic together with the social inadequacies of in- migrants in urban environments can exacerbate these effects. In addition, this illness and poverty can act as barriers to development - of the community and physical infrastructure.

Health status - urban slums

As indicated above, the current health status in slums is usually below that of other urban dwellers. Malnutrition, infectious disease (especially water-related and respiratory diseases) and psychological disorders are compounded by the physical conditions, the low employment levels and opportunities, stress over security of tenure (or rather lack of it) and cultural changes.

Many of the inhabitants are in-migrants who tend to be young. The birth rate and both the infant and general mortality rates are higher than in non-slum areas in the same city. Incidence of gastro-intestinal disease and respiratory diseases such as tuberculosis are high. For instance, in one Calcutta slum the incidence of TB has been as high as 10 times that in other areas; in Allahabad (1984) one of the slum communities had morbidity levels of 60 and 45-55%, respectively for scabies and intestinal worms.

Implementation of water supply and sanitation programmes alone have the potential to reduce these morbidities considerably:- 80-100% for scabies (and Guinea worm); 40-50% for roundworms (Ascariasis). The full potential will only be reached if approaches such as that outlined in figure 3 are employed. Detailed treatment of these approaches is beyond the scope of this paper but they are summarized by the acronym 'FISTE for HAND'.

CONCLUSION

Health is dependent on many factors, mainly within the control of humans themselves. To achieve 'Health for all' requires not only an integrated, multidisciplinary approach but also action by many people at many levels - from the individual and familty through the local and national communities to international organizations. The scope of the task may seem daunting but if the slogan for World Health Day 1990 is adopted much will be achieved.

THINK GLOBALLY - ACT LOCALLY

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16th WEDC Conference
Infrastructure for low-income communities
Hyderabad, India 1990

The family handpump scenario

Arthur C McIntosh

INTRODUCTION

Background to Sector

Rural water supply and sanitation traditionally receive less than 20 per cent of government expenditure for the water supply and sanitation sector in Asian countries, yet about 70 per cent of the population reside in rural areas. Furthermore much of that investment has been characterized by a top-down approach which has resulted in poor sustainability.

The bottom-up approach is now recognised as an essential ingredient to success. Real demand is measured by the expressed need of the end users and their willingness to pay for an improved water supply. This means more sociologists and fewer engineers in the development process, it means a learning approach rather than a blue-print approach and it means greater emphasis on ownership of the facility by the beneficiary.

Regional Study

Self-help family water supply through privately owned shallow dugwells and tubewells has the potential to satisfy a significant slice of the total demand for improved rural water supplies in Asia without a significant drain on government resources. Millions of families in Asia already own their own well - many with handpumps, but how many more might do so given incentives of easy credit, economies of scale provided by a project, the guidance of a competent grass-roots NGO and the support of a village women's organization? This was the question addressed in the "Regional Study on Domestic Shallow Well Water Supplies" recently executed by the Asian Development Bank (with UNDP funding) in Bangladesh, Indonesia, Pakistan, Philippines and Thailand.

This paper describes the Family Handpump Scenario which was the central theme to that study and discusses some of the findings of that study which are presented in the Asian Development Bank publication "Women and Water" (February 1990).

THE FAMILY HANDPUMP

Definition

A handpump may be used to lift water from a tubewell or from a covered dugwell. It may also be used to lift water from a below-ground rainwater cistern.

The term "family handpump" was coined by the author as a means of differentiating from the "community handpump". It is a handpump normally owned by an individual family and used by not more than 20 people. It would most often be used on a shallow dugwell or tubewell where the maximum depth to water did not exceed suction mode limits of around 7 metres. There are several million in use in China, and in Bangladesh; and hundreds of thousands in other Asian countries. These pumps, even though they have some drawbacks, are cheaply produced by local manufacturers, are durable enough for their light use and can easily be maintained by their users. To clarify the definition of a family handpump a comparison of the family handpump with the community handpump is given in Table 1 and some advantages and disadvantages of the family handpump are given in Table 2.

Table 1: Comparison of Family and Community Handpumps

	Family Handpump	Community Handpump
Well Type	Shallow	Mostly deep
People Served	5-20	50-500
Cost of Installation	$50-$200	$500-$5,000
Handpump Source	Village Market	City/Import
Driller Source	Village Market	City
Purchaser	Family	Government/ UNICEF
Owner	Family	Community
Maintenance	Family	Community
Spare Parts Source	Village Market	Institution/ Community
Average Life	10 years	5 years

Table 2: Advantages and Disadvantages of Family Handpump

Advantages	Disadvantages
1. Convenience.	1. Potential for community pollution.
2. Time and energy saved.	2. Potential for aquifer pollution.
3. Better health.	3. Potential for well pollution.
4. Privacy.	4. Less socializing.
5. Potential family income.	
6. Dignity and prestige.	
7. Reduced maintenance/simple technology.	
8. No government responsibility.	
9. Optimum use of aquifer.	
10. Safety improved.	

Hardware

Most of the family handpumps in use today are suction type ones which can be used for water depths up to 7 metres. They generally have cast-iron bodies, a lever handle and are generally available in the village market for $20-$30 excluding pipework. However, with the falling levels of shallow groundwater aquifers throughout Asia, the most important consideration is the development of a cheap family-type handpump for lifting water up to 12 metres deep. The UNDP/World Bank Global Handpumps Project has concluded there is a good future for direct-action PVC handpumps such as the Tara (in Bangladesh) to meet such demands. Other PVC direct-action handpumps include the Wavin, Blair and IDRC-UM. All are still undergoing development testing. At the moment, price is paramount for a family handpump and the PVC direct-action handpumps are still too expensive (at around $90+) to find their way into the commercial market. Another development which is occurring in Asia is the use of cheap electric pumps instead of handpumps -these are available for about $50.

Economics

The cost of a family dugwell with a handpump in the developing countries of Asia ranges from $100-$300 and for a family tubewell with handpump from $50-$200. As to whether or not these are affordable for families, the best measure is the number who already own these facilities. It is also necessary to remember that the target may be only 10-20 per cent of the total demand for improved rural water supply - not everyone in a village will desire a family well with handpump and not everyone can afford it. A typical case may be:

Annual household income	$1,000
Cost of family well + handpump	$ 150
Annual repayment over 3 years (no interest)	$ 50

This represents 5% of household income which appears affordable.

The Grameen Bank in Bangladesh has shown that it is not necessary to have collateral to provide credit to the landless poor.

STUDY FINDINGS

Existing Situation

Table 3 shows the existing water supply and sanitation service levels in the 20 study villages of each of the five study countries. It must be emphasised however, that whilst the findings may be indicative, they cannot be deemed representative of conditions in any given country.

Table 3: Water Supply and Sanitation in 20 Study Villages (1989)

Country	Private Open Well	Private Well + HP	Public Well/ Share	Sanitary latrine
Bangladesh	5%	11%	84%	6%
Indonesia	37%	8%	55%	9%
Pakistan	32%	31%	37%	8%
Philippines	8%	32%	60%	71%
Thailand	47%	1%	52%	55%

Points to note From Table 3 include:

1. Low latrine coverage in Bangladesh /Indonesia/Pakistan.
2. Low incidence of family handpumps in Thailand.
3. Private facilities accounted for 40% - 60% of all rural water supply in four of the five study countries.

Demand

The results of the study indicated an expressed demand for the family handpump of around 10% of households interviewed in Thailand, 20% in Indonesia, 30% in Pakistan and 70% in Philippines and Bangladesh. However there was a general demand for some form of self-help family water supply and sanitation in all the study countries of the order of 80-90% of households interviewed.

Other Findings

Pakistan appeared to be a special case where due to the strong cultural influences relating to women, several of the villages surveyed already had 100% coverage by family-owned handpumps. Unfortunately this had also created serious drainage problems for the communities. Generally latrines were seen as a priority in Pakistan. Family-owned handpumps were common in many of the villages in the other study countries and there was a widespread custom of sharing water from these facilities with neighbours at no cost. The idea of ownership of a handpump being shared between two or three families (to become affordable) was rejected in all countries. A need obviously exists for health education. Health was seldom given as a reason for wanting a family well with handpump or a latrine; convenience and privacy were the main reasons. In some countries such as Thailand and to a lesser extend Indonesia, electric pumps were an affordable alternative to handpumps for the family well. It was evident that to be attractive, the credit system would have to adopt a principle of collateral based on group or social responsibility rather than property ownership.

Study Conclusions

It was concluded from the studies:

(i) That there is a significant demand for the family handpump in Asia but a very great demand for some form of self-help family water supply and sanitation.
(ii) Family water supply and sanitation will greatly benefit village women.
(iii) Village women are willing and able to take the lead role in implementing self-help family water supply and sanitation projects.
(iv) The scope of such a project should include water supply, sanitation, drainage, health and hygiene education and income-generation elements in an integrated package.
(v) Women must be made the focus of the project and their participation should be facilitated at all levels.
(vi) The beneficiaries will largely be determined by the degree to which governments wish to become involved. Only with government subsidies could the poorer people participate. In the event that governments were not providing subsidies, the major implementing role would more naturally fall to NGOs.

A PROJECT SCENARIO

A project scenario proposed by the author is presented below:

1. Government selects two strong NGOs to introduce an element of competition.
2. Funding agency provides each NGO with $50,000
   (i) for administration and implementation of the project (20%); and
   (ii) as seeding monies for the credit scheme (80%).
3. NGOs determine villages and locations for project.
4. NGOs and women's groups in selected villages design and implement their own schemes.
5. Government conducts tripartite review after 12 months with funding agency and NGOs.

CONCLUSION

The Family Handpump Scenario gives focus to an alternative development mechanism which is women-oriented and embodies important principles of self-help and ownership which will ensure sustainability. Its success will depend on the extent to which governments are prepared to allow grass-root NGOs to play the major role in implementation and to allow the development to expand by natural association rather than forced mass coverage.

(The views expressed in this paper are those of the author and do not necessarily reflect those of the Asian Development Bank.)

16th WEDC Conference

Infrastructure for low-income communities

Hyderabad, India 1990

Rural housing in Zimbabwe

Dr Martin Mansell

INTRODUCTION

In Zimbabwe nearly 7 million people of the population of over 9 million live in the rural areas. As in many developing countries the rural people are at a considerable disadvantage in terms of the standard of their housing and their access to means of improving it. A recent government report considered that about 70% of existing housing in rural areas was substandard and indecent.

Even if the present standards were satisfactory it is estimated that a total of about 2 million new houses will need to be constructed to satisfy the UN Global strategy of shelter for all by the year 2000 of which a large proportion will be in the rural areas (ref 1).

There are clearly going to be many problems if such a policy is pursued. The main constraints facing such a massive investment programme in housing in the rural areas can be summarised as :

1. labour skills
2. materials supply
3. finance
4. energy costs

It is tempting to underestimate the level of resources already available in rural areas particularly in the first of these categories and equally to undervalue the contribution that alternative materials can make to producing rural housing of an acceptable standard.

This report considers the problem of rural housing in Zimbabwe from the point of view of:-

1. the existing methods of construction
2. the existing types of skill available in rural areas
3. financial and other constraints
4. the contribution of alternative materials to solving the housing problem.

It is partly based on a survey carried by the Department of Civil Engineering of the University of Zimbabwe in 1986 into Rural Housing Needs and Resources (ref 2).

RESULTS OF SURVEY

General

The survey took the form of a questionnaire completed by engineering students on the basis of interviews with 200 households in various rural areas. Over half the surveys were carried out in 'communal lands' the remainder being mainly in commercial farming areas. There was no criteria of selection apart from the requirement that they should be in a rural area.

In the survey an attempt was made to identify the priorities of the householders in terms of various spending options. They were asked to rate the top 5 out of 9 possible choices of spending a large (but unspecified) sum of money.

Figure 1

IMPORTANCE RATING OF SPENDING OPTIONS

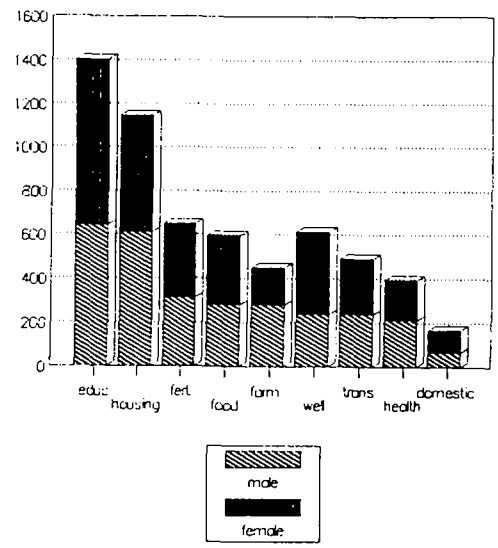


Figure 1 shows that education and housing were clear favourites and that there was, perhaps surprisingly, little difference between males (80% of the householders) and females. The popularity of education may be partly due to the high profile it receives with government spending and that for housing may be partly out of respect for the aims of the survey.

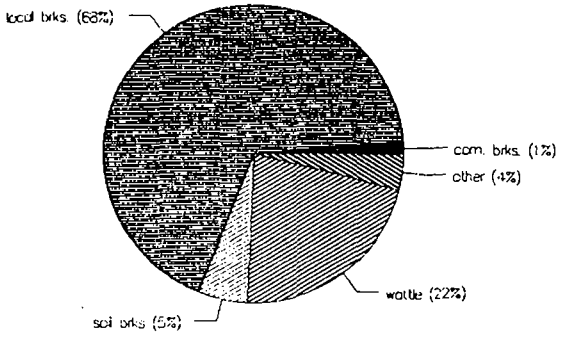
Existing Housing Construction

The 200 households interviewed comprised a total of 924 houses of which about 42% were used for sleeping and 23% for cooking. The remainder were used for storage, latrines or for multiple purposes.

Of these buildings 379 (2 buildings per household) were selected for more detailed study (unless the household only had one house).

Figure 2

TYPE OF WALL CONSTRUCTION



TYPE OF ROOF CONSTRUCTION

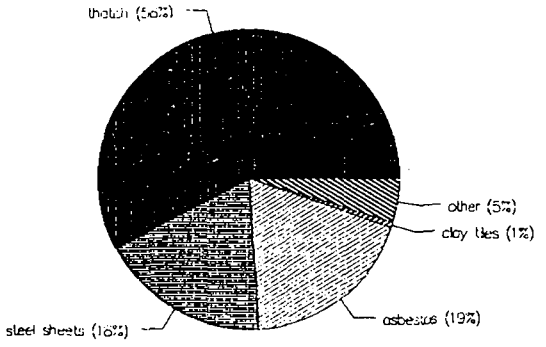
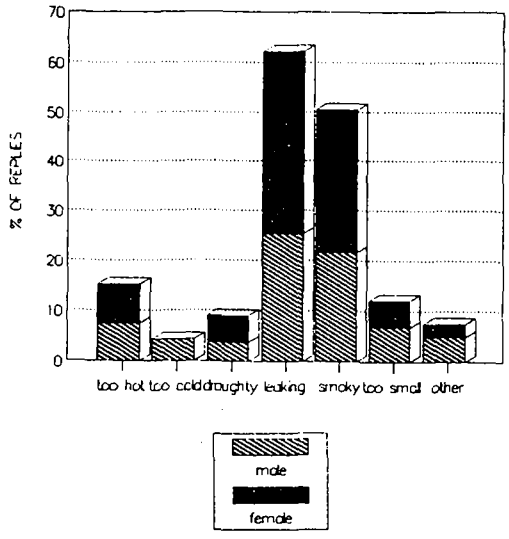


Figure 2 shows the main materials used for the construction of the walls and roofs. Most walls were constructed of local burnt bricks and the majority of roofs were thatch.

The householders were asked to indicate their most serious complaint about their building. The results shown in Figure 3 indicate that the most common problems concerned smoke and leaks. The differences between male and female respondants were relatively minor except that more males than females had no complaints at all.

Figure 3

COMPLAINTS WITH BUILDINGS



23% of the buildings had had the roof replaced at some time. A further 15% had had repairs to the roof carried out and 12% had had other repairs carried out. Only 1.8% of the buildings had a lightning conductor.

Availability of Building Materials

Life in rural areas is characterised by problems of transport and availability of commerical products. Commercial building materials are particularly difficult to obtain because of the relatively high cost of transport.

A list of 4 common commercial materials was selected, together with 1 building tool (a carpenter's hammer). For each of these the students were asked to find out whether they were available at the local business centre and if not how far away the nearest source was. The results are summarised in Table 1.

Table 1 Availability of Commercial Materials

Item	% available at local bus. centre	Dist. to alternative source (km)	Transp. Element %
Cement	74	44	44
Roofing Sheets	32	48	9
Sawn Timber	34	37	16
Bricks	21	41	33
Hammer	46	44	0.2

It can be seen that less than half the business centres stocked common building materials such as steel roofing sheets, sawn timber or bricks and since the survey was carried out cement has become much more scarce than indicated by the survey.

The average distance to the nearest business centre was 5.6km. In many cases the nearest alternative source was over 40km away and transport costs account for nearly half the cost of cement and a third of the cost of the bricks. However these figures were based on small quantities.

To assess the availabililty of local 'alternative' building materials a similar list of 5 typical materials was selected. In this case the question concerned whether the material had been used and the distance to the nearest source. The results are presented in Table 2.

Table 2 Availability of Local Materials

Material	% Available and Used	Average Dist. to Source (km)
Clay	88	3.7
Building Sand	75	6.0
Thatching Grass	92	7.4
Wood Poles	96	4.8
Sisal	29	8.7

It can be seen that local materials are used widely in rural housing (with the exception of sisal) and sources are generally available within a reasonable distance.

Labour and Skills

The average overall time of construction of the houses was 3.7 months although it is likely that the work did not proceed continuously. The actual times varied from less than 1 month to 40 months. The most popular time for starting construction was during the winter with 75occuring between April and October. This corresponds to the dry season when the labour requirement for agriculture is less. The average age of the building was 11.7 years.

The average numbers of people involved in different aspects of construction are given in Table 3.

Table 3 Number of people in House Construction

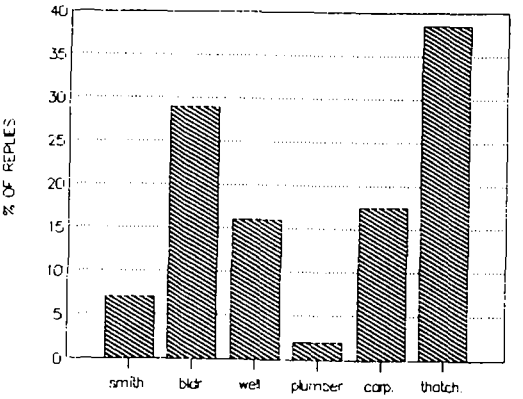
Operation	H ousehold Members		Non Household
	Male	Female	Members
Floor	1.8	1.0	1.4
Wall - collect mats.	2.2	1.0	1.3
- prepare mats.	1.9	0.9	1.6
- construction	2.0	0.7	1.5
Roof - collect mats.	1.9	0.9	1.0
- construction	2.1	0.5	1.6

The divisions of labour into household members shows almost equal proportions of males and females.It can also be seen that the majority of the work was carried out by household members. There is normally no shortage of unskilled labour depending on the agricultural and other demands.

Figure 4 shows the incidence of building related skills within the households. It shows that a third of the housholds had at least one thatcher and/or a builder although the level of skill was not specified. Even if the skills are not found within the household they are normally readily

Figure 4

DISTRIBUTION OF SKILLS



available within the community.

However management and financial skills were not investigated and there is likely to be a severe lack of skill in these areas.

Finance

Finance is one of the main constraints on large scale housing development. It was not possible from the survey to derive accurate figures for the costs of rural housing because people were naturally reluctant to provide such information . However even using family labour and local materials it is likely to be a substantial proportion of income.

58% of the householders considered that they would be elligible for a loan from a bank or building society. However such institutions are normally reluctant to lend money for rural housing partly because of the uncertanity of income and more importantly because the applicant is unlikely to be able to show any legal title to the land or any other security.

A further 27% thought they could obtain finance from a friend or relative and the remaining 15% did not think they would have access to any finance. For the samples in the communal areas only the figures were very similar being 56% 28% and 16% repsectively.

Environmental Constraints

The use of both local and communal building materials by definition involves some environmental degradation.

For example burnt clay bricks which are widely used in the rural areas need about 1000 kg of wood to make 1000 bricks. However wood is already widely used as a primary energy source for cooking and heating. About 6 million cubic metres of wood are consumed each year in Zimbabwe and there is widspread concern about the effects of deforestation. Even thatching requires large inputs in terms of land area; it is estimated that at least 15 000 hectares of grass are cut each year for thatching.

OPTIONS FOR IMPROVING RURAL HOUSING

In this section a few examples of current research by the Department into improving house construction are given.

Burnt Clay Bricks

As has been seen, burnt bricks are very widely used for house construction, and work in the Department has concentrated on improving the consistancy of the brick properties and in economising in fuel use.

Cement Stabilised Bricks

The advantages of cement stabilised bricks are the substantial use of local material and labour and the reduced energy requirement compared with burnt clay bricks. Using a 10% cement clay mixture the theoretical energy requirement (for the cement) is about 0.7 MJ/kg compared with 1 - 3 MJ/kg for concrete blocks and 3 - 6 MJ/kg for burnt bricks. The strength of such bricks (0.5- 4.0MPa) is of the same order as burnt clay bricks.

The Department has also investigated the use of such bricks in dome type roof structures which could largely eliminate the need for timber in housing.

Compressed Soil Blocks

A Zimbabwean company has recently imported a special press which can produce large blocks (300 x 190 x 100 mm) from local soil at a rate of up to 10 000 blocks per hour. It is claimed that there is no need to add cement and that the blocks can be laid dry since their size (being laid flat) and their adhesion provide the required stability.

The Department tested blocks made from two types of soil and found their strength more than adequate although comparison with conventional bricks is difficult because of the size factor. Shrinkage (measured after 7 days) was quite significant especially in the more clayey material while the moisture absorbtion was more noticeable in the silty material.

Fibre Reinforced Cement Roofing

Sisal reinforced cement is used in Zimbabwe mainly for roofing sheets and tiles.

A number of tests were carried out in the Department on the flexural and impact strength of sisal reinforced mortar sheets. Although the fibre strength is relatively high the low elastic modulus means that this strength is not moblised before the concrete cracks and thus the flexural strength does not improve significantly with increased fibre content although the fibre length is significant. There are also doubts about properties of the fibre in the long term since the sisal tends to react with the alkliis in the cement and become brittle with age.

GENERAL CONCLUSIONS

It is clear from the above that the major constraints affecting the development of rural housing are in the areas of finance and the availability of materials.

Examples have been given to show that local materials can be used to provide a building of more than adequate standard.

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16th WEDC Conference

Infrastructure for low-income communities

Hyderabad, India 1990

Infrastructure for Palestinian Refugees

Michael D. Smith

INTRODUCTION & HISTORICAL BACKGROUND

There have been Palestinian refugees ever since the State of Israel was created out of conflict from the former nation of Palestine. Considerable numbers of Palestinian Arabs were driven from their homes, or fled from them, during the months before and after the establishment of the State of Israel in May 1948. (Ref. 1)

There are three possible solutions in attempting to resolve conventional refugee problems: repatriation, emigration from the country of first asylum, and integration into the country of first asylum. The Palestinian refugee problem is, however, different from that faced by most other refugees. To illustrate this, it is useful to consider each of the usual options in turn:

Repatriation. The possibility of the Palestinian refugees returning to their homes, on any significant scale, was rejected by the Provisional Government of Israel on security grounds (Ref. 1) and has been rejected by Israeli governments since.

Emigration. The Palestinian refugees wished to return to their homes at the earliest opportunity, and saw themselves not as refugees, but as temporary absentees. (Ref. 1) Even today, some forty years later, many Palestinians consider their home to be where their family lived prior to 1948.

Integration. This option remained as a possible solution. The refugees saw this as a temporary solution, prior to repatriation, and were willing to work (if work was available) in the host countries of Syria, Lebanon, Jordan and the Gaza Strip. (Ref. 1)

Emergency relief was initially provided by various agencies, until in 1950 UNRWA (the United Nations Relief and Works Agency) started operations as a temporary agency. (Ref. 1) Forty years later, that temporary agency is still operating because the Palestine problem has not yet been resolved. The present *Intifada*, or uprising, has been in operation since December 1987, with the Palestinians pursuing a policy of non-cooperation with the Israeli administration.

Over the past forty years, the number of refugees in the West Bank and Gaza Strip has increased considerably, as a result of natural population increases. Nearly 200,000 refugees fled from these territories when they were occupied by Israel in 1967. (Ref. 2) In September 1989, the refugee population of the Gaza Strip was approximately 474,000, of which about 261,000 were living in the 8 refugee camps. In the West Bank, the total refugee population at that time was approximately 402,000, of which about 107,000 were living in the 19 refugee camps. (Ref. 4)

PHYSICAL PLANNING OBJECTIVES

This paper is based on a period of sixteen weeks spent by the author in the Israeli-occupied territories of The West Bank and Gaza Strip. This was as a member of a Feasibility Study Team assembled by Llewelyn-Davies Planning, and funded by the British Government through the Overseas Development Administration. The Feasibility Study Team reviewed work that has been undertaken by UNRWA, and drew up recommendations to improve the agency operations in the future. The operations of UNRWA are divided into three sections: Health, Education and Training, and Relief.

From the outset, the Feasibility Study Team identified clear objectives (Ref. 4, adapted) of a practical nature:

a. To identify practical means of improving living conditions for camp refugees.

b. To provide UNRWA with a planning framework in which immediate, early, mid-term and longer-term programmed improvements can be undertaken.

c. To identify constraints to, and requirements for, implementation.

d. To improve the quality of information on which projects are planned and implemented.

e. To propose measures which:
- are low cost,
- maximise benefits to camp residents,
- realistically reflect recurrent expenditure problems; and
- are attractive to funders.

f. To use shelter and infrastructure programmes to stimulate economic development, and to further other development programmes.

This paper deals only with aspects of physical infrastructure, although all aspects of the ongoing refugee programme were reviewed.

REVIEW OF EXISTING FACILITIES

It is not possible, in a brief review, to provide a detailed description of typical conditions for Palestinian refugees. Not all refugees live in camps. Conditions vary between the West Bank and Gaza Strip, and between individual camps. Camps in the Gaza Strip range in size from about 11,000 to 56,000; while those in the West Bank have smaller populations from about 700 to 13,000. (Ref. 4) The Gaza Strip now has one of the highest population densities in the world, at approximately 1,900 people/square kilometer. (Ref. 2)

In the various sectors associated with physical infrastructure (shelter, environmental sanitation, refuse disposal, water supply, roads and paths, electrification) the level of facilities available now is generally better than that provided for the original refugees. Some improvements were made by the agency (UNRWA), others by individual refugee families. The quality of most facilities has deteriorated over the years, for reasons such as staff or funding shortages, inadequate maintenance, or the continuing population growth. There is therefore an urgent need for upgrading and maintenance.

PLANNING FOR FUTURE FACILITIES

In all sectors of activity it is possible to identify specific projects that need to be, and could be, implemented. Development is possible in spite of the numerous severe constraints that limit the options for implementation.

Needs and Constraints

The plight of the Palestinian refugees has, all too often, been seen as a temporary problem. Planning for the future has therefore largely been neglected, with many projects being postponed until the last moment, and then implemented hastily.

The weaknesses of the lack of forward planning show in various ways, and fundamental planning techniques can be applied to alleviate these in the future. Needs, solutions and constraints should all be identified.

For each field of activity it proved helpful to adopt the following simple procedure:

- Identify the needs;
- Identify the strategic options;
- Identify the detailed options; and
- Identify the factors influencing the selection of options.

The various constraints that influence the selection of options are more severe than in most other situations. Identification of these constraints show that some could be overcome within a relatively short period, while others are more long-term. Some constraints are inherent in the prevailing conditions, others can be removed by appropriate action. The following list, (Ref. 4, adapted) while not comprehensive, gives some indication of the problems that hinder development of physical infrastructure for Palestinian refugees.

- Community attitudes can only be changed through education, example and demonstration. Evidence of community interests may provide opportunities for attitudes to be changed.

- Operational difficulties will be constraining factors so long as strikes, curfews and disturbances continue.

- Limitations on physical space will continue to be a problem while the refugee population increases and the areas occupied by the camps remain fixed.

- Funding and staffing will continue to major constraints if facilities are introduced that are both expensive to provide and costly to maintain. A fast growing population with a need for essential services will require significant funds and trained staff.

- Some constraints are internal to the agencies working for the Palestinian refugees. Greater co-ordination and improved planning can reduce the effect of these constraints.

- The restrictions imposed by the Israeli authorities create major constraints in all fields of development activity.

- Some constraints, associated with the physical and geographical situations of the various camps, will persist whatever political or other changes take place.

Linkages between different sectors

A major constraint to development has been the lack of integrated and co-ordinated programmes. (Ref. 4) It is convenient to distinguish between individual sectors of activity, such as sanitation and road construction, yet such distinctions are inevitably false. A development project that is primarily associated with one sector will have linkages (strong or weak) with other sectors (see Figure 1). Due consideration needs to be given to the linkages that exist if there is to be co-ordinated development.

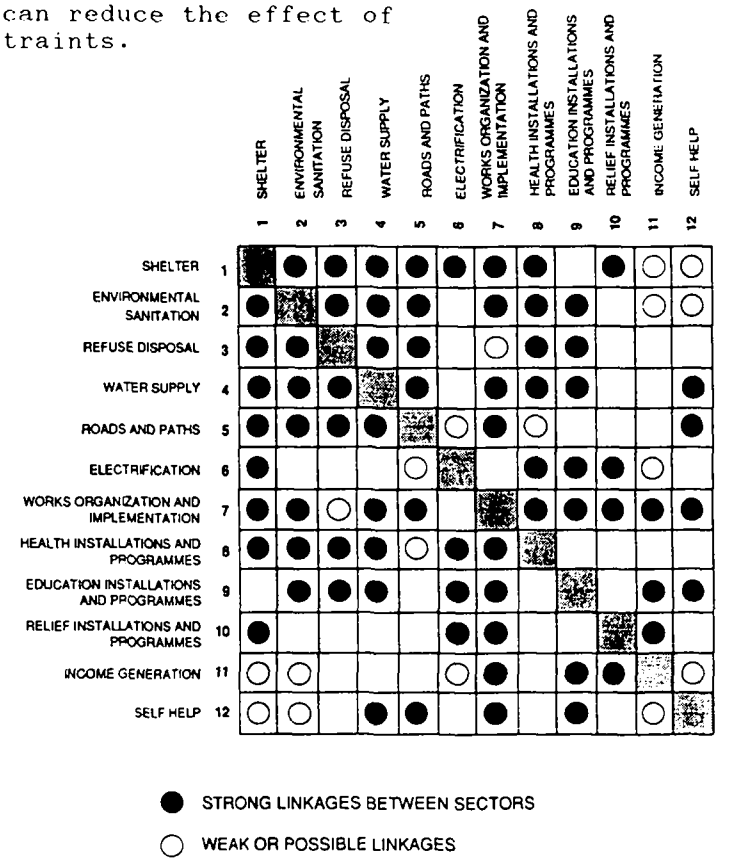

FIGURE 1 LINKAGES BETWEEN DIFFERENT SECTORS (Ref. 4)

Phasing of developments

Different time periods were identified to encourage the gradual introduction of improved planning techniques, to correspond to the periods for which constraints may apply, and to allow for political changes. The various phases, and the sectoral objectives, (Ref. 4) are as follows:

Immediate phase: (first 12 months) To improve the development performance of key parts of current activities.

Early phase: (next 36 months) To strengthen the development role of currently planned activities, in line with mid-term and long-term objectives.

Mid-term phase: (from end of early phase to political solution of the refugee problem) To promote and support local enterprise and self-help, in line with long-term objectives.

Long-term phase: (the period following a political settlement) Objectives cannot be predicted at present.

CONCLUSIONS

The development problems for Palestinian refugees in the West Bank and Gaza Strip are extremely difficult to resolve. Careful use of planning techniques would nevertheless allow significant co-ordinated improvements to be made in various sectors.

ACKNOWLEDGEMENTS

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Infrastructure for low-income communities

Hyderabad, India 1990

Soil blocks for rural housing

N S Sodhi and Jitender Singh

"A house is the most visible symbol of a family's identity,the most important possession a man can ever have, the enduring witness to his existence, its lack one of the most potent causes of civil discontent and conversely its possession,one of the most effective guarantees of the social stability".

(Hasan Fathy)

INTRODUCTION:

Shelter is a basic human need but today we are faced with an uncomfortable gap between the need for shelters and their availability especially in the Third World. Between now and the year 2000 we would need over a billion houses to house the poor in developing countries. The housing scenario in India is none too encouraging. Housing shortage in rural & urban areas has reached alarming proportions. The shortfall which was 25.6 million units in 1986 is likely to go upto 39.1 million units by 2001. The problem is more acute in rural areas which account for 75% of the total shortage.

EARTH CONSTRUCTION - A VIABLE SOLUTION:

Housing development has various complex dimensions. An important one is the use of appropriate building technology. One of the solutions which has been stressed time and again is the use of local materials and local skills to produce economic,ecologically compatible and energy efficient buildings. In such an context, earth construction assumes importance. For thousand years earth/mud has been used as a basic material in construction. 3500 years earlier, Harapans built with mud. Even today,80 to 90% of the rural population lives in houses made of mud (30% in cities). With the onslaught of western oriented values,mud was relegated to the status of a 'poor man's material. The indiscrete copying of western concepts and values overshadowed our traditional knowledge & building systems which were well adapted to our environment. However,the skyrocketing costs of building material,the concerns about conservation of environment & energy has once again activated revival of interest in mud construction. At the same time,building technologies have been developed to provide optimum efficiency to mud construction. One such technique is the use of Stabilised Soil Blocks as a substitute for burnt bricks for construction of walls.

STABILISED SOIL BLOCKS:

Stabilised Soil Blocks are a walling material comparable to burnt bricks. They are made by pressing a mixture of soil & stabiliser like cement,lime,chemical etc.in a machine (press) as a suitable moisture content. These Blocks,after curing,can be used as a substitute to bricks in the construction of walls. Unlike bricks,no burning is involved in this process. The improvement in properties in this case is affected by one or more of the stabilisation procedures viz; mechancal,physical and chemical stabilisation.

PRODUCTION PROCESS:

The normal production process for Soil Blocks involves:

Soil Selection & Testing:

A sand and fine gravel content of 80% and a minimum clay content of 10% is generally considered ideal. The soil composition chart (Fig.I) shows the ideal,the recommended and the possible composition suitable for Block production.

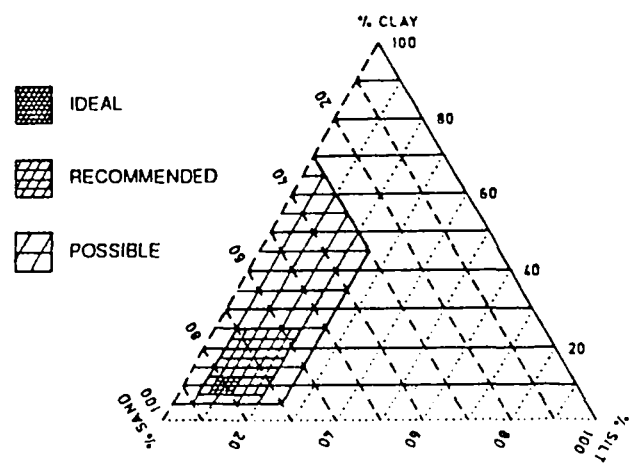

Fig.1: Soil Composition Chart

Various field tests have been developed for determining the suitability of soils. These include visual examination,touch test,sedimentation test & lustre test to

judge proportion of coarse/fine fractions & smell tests for organic matter. If required laboratory tests such as linear shrinkage,grain size distribution (sieve analysis),Atterberg limits,sedimentation analysis,Proctor compaction tests etc."(Ref. 1)". The best method,however,is trial and error. Sample blocks are made using different soil types & mixes,but using same methods that would be used for full scale production. Performance tests are then made on these blocks to determine the most suitable materials and their proportion.

Selection of Stabiliser Type & Amount:

It is not compulsory to add stabilisers but it is generally recommended to obtain blocks with better strength & durability. Of the various materials used as stabilisers,cement,lime & bitumen are the most common.

Nearly all soils,except those which have an excessive content of organic material can be treated with cement (3% to 19% by weight). The greatest compressive strength is obtained with gravels & sand rather than silts & clays. Soils which have large clay fraction require large quantities of cement. In practice, cement is not used for stabilising clay when liquid limit is higher than 30 percent. Between 2 to 4% of bitumen added to soil-cement as emulsion or cutback makes it waterproof.

Lime is more effective than cement on clay-sand soils & especially on very clayey soils. For ordinary stabilisation between 6% to 12% lime is used. Sandy soils or sand gravel soils are more amenable to stabilisation using bitumen. The quantity of bitumen ranges from 2 to 6 percent.

Soil Preparation (Crushing,Sieving & Mixing):

The excavated soil is ground & screened through a wire mesh to obtain a maximum grain size of 10mm. If the soil has large number of clay lumps,they are broken. The soil is then be mixed intimately with the stabiliser. Cement and lime are mixed in dry state either manually or in a mixer. Bitumen is used as stabiliser in cutback or emulsion form. Predetermined quantity of water is then sprinkled for even distribution and mixed. To obtain maximum density, soil is compacted at Optimum Moisture Content (OMC). OMC varies from 12-18% in different cases. Water little more than the OMC is added to account for evaporation losses. A simple field test to determine OMC is shown in Figure II. When using cement as binder, only so much material should be prepared as can be used up in about 20 minutes, with lime there is no time limit.

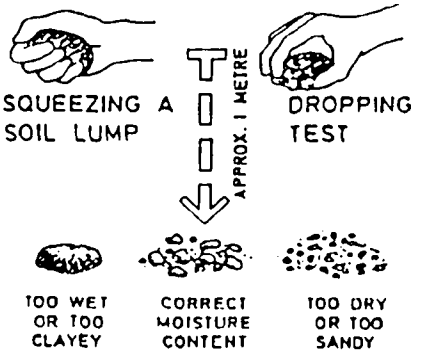

Fig.II: Field Test for OMC

Compaction of Blocks:

Compressive strength,which is the most critical property and the density of block have a close positive correlation. A small increase in density causes a dramatic improvement in compressive strength of the block. This underlines the importance of producing high density blocks. Various methods used for compaction of blocks are:

Hand Moulding : The compaction in this case is achieved by tamping of soil in a mould.

Compaction using Manual Presses: The procedure in this case involves filling the mould(s), compacting the soil using a lever mechanism, demoulding and stacking of blocks.

Production of Blocks using Mobile Soil Block Plant: The mobile soil block plant is a trolley mounted machine powered by a Diesel Engine and consists of a mixer unit and a hydraulic press. The sieved soil is fed manually into the mixer and recommended doses of stabiliser & water are added. Subsequent operations of mixing, feeding to moulds, rotation of mould table,compaction & ejection of blocks etc.are automatic. The Soil Blocks ejected by the machine are removed manually & stacked for curing/drying.

Table-I shows a comparison between various features of manual presses and the Mobile Soil Block Plant. The Soil Block Plant has the advantage of greater compaction pressure and production capacity but is costlier than Manual Press.

Table I:Comparison Between Soil Block Machines

FEATURE	MANUAL PRESS*	MOBILE SOIL BLOCK PLANT**
Weight (Kgs)	100 - 140	2100
Rated Output (Brick size)	1000 Blocks/ day	3000 Blocks/ day
Compaction pr.	20-30 kg/cm²	50 kg/cm²
Energy source	Manual	15 H.P Diesel Engine
Manpower	4 - 6	5
Price (Rs)***	5000-7000	3,00,000

* ASTRA, BALARAM, ITGE VOTH ETC.
** Intra Consolid CLU-3000
***Rs.100 = US $ 5.80 (19.05.1990)

Drying or Curing:

Unlike traditional hand-moulded mud blocks,stabilised soil blocks are carried to a shaded curing area to prevent excessive rapid surface drying which may cause shrink cracking. Alternatively, the stack can be covered by a plastic sheet & moistened by spraying water. Cement stabilised blocks should be cured for about 21 days - 7 days in stacking yard and subsequently on the constructed wall. In case of lime,curing in stack for a period of 15 to 21 days is necessary. For rapid production,steam curing can be used. The blocks will acquire strength rapidly and will be ready for use on the next day.

TECHNICAL SPECIFICATIONS FOR SOIL BLOCKS:

Blocks can be produced using either Manual Presses or Mobile Soil Block Plant. The advantages in the first case are the lower cost of machine and greater labour-turnover ratio, whereas in the second case,we get better technical properties saving in time,labour & better quality control. Considering various socio-economic parameters and likelihood of acceptance of technology by public, the Council recommended the use of Mobile Soil Block Plant. The physical properties of a block produced by Soil Block Plant are:

Size: 229mm x 114mm x 76mm (Stnd.Brick)

Block weight: 3.75 Kgs (average)

The most important performance parameters which are used as a yardstick to determine the suitability of blocks are:

- The block strength to bear the weight of a wall & the superimposed load.
- Water absorption.
- Resistance to erosion caused by rain.

The recommended values for these properties as per IS:1725-1982 are as shown in Table-II. The methods for testing compressive strength & water absorption are the same as those used for testing burnt clay bricks (as given in IS:3495:1976.

Table II: Technical Specifications

COMPRESSIVE STRENGTH:	Class Designation	Av.Comp.Strength Kg/cm²
	20	20
	30	30
WATER ABSORPTION:	Av.after 24 hours immersion	≯ 15%
WEATHERING: Resistance to rain impact	Limiting dia. of pit	Max.loss in weight
	1 cm	5%

The resistance to erosion caused by rain impact (weathering) is evaluated by subjecting a block to a continuous spray of water at a constant pressure of 1.5 ± 0.2 kg/cm² for 2 hours and examining the surface for possible pitting. The acceptance criteria are as given in Table II.

SURFACE PROTECTION FOR SOIL BLOCKS:

In principle, surface protection is not necessary for well built structures in stabilised soil. Stabilised earth walls stand up well to bad weather for many years. But rendering & paints may sometimes be desireable from other considerations such as aesthetics,reduction of heat gain by reflection,easy maintenance of surface etc. Some commonly used techniques are:

Rendering: may be in earth, stabilised earth, or a sand-based mortar to which a hydraulic binder has been added: cement or lime or some additive. An exhaustive study of the various plasters was done by Development Alternatives "(Ref.2)". Lime-surkhi & lime-cement-sand plasters emerged as the most erosion resistance & efficient plasters.

Paint: These include conventional paints,distempers & washes. Washes include cement or lime slurries or bitumen in the form of a cutback. These are applied with a brush or a spray gun.

Impregnation: The surface is impregnated with a natural (e.g.linseed oil) or a chemical (e.g.silicon) product. This confers qualities like impermeability, hardening, colouring etc. Two low cost formulations have been developed at CBRI, Roorkee. Similarly,

consil being marketed by M/s Intra Consolid (I) Ltd is a siliconvinyl toulene acrylate copolymer which is applied to wall in the form of emulsion. The treatment costs Rs. 6/- to Rs. 8/- per sq.m.

ECONOMICS:

The parameters for cost-calculation using semi-mechanised Mobile Soil Block Plant are given below. In case manual presses are used, the cost would be lower due to lesser cost of machine.

- Production rate = 375 Blocks/hour
- Block size = 229 x 114 x 76mm
- Labour = 1 Operator, 4 Unskilled
- Diesel reqd. = 4 Litres/hour
- Machine cost = About Rs. 3,50,000/-
- Repair & Maint. = 5% of cost of machine

The cost of Soil Block has been worked out under two conditions:

Alternative-I: Assuming that machine is made available to development agency on No-cost basis i.e. purely promotional activity.

Alternative-II: Assuming that activity is taken-up on commercial basis, 14% interest on capital & redemption of machine cost in 5 years with zero salvage value.

The cost/thousand blocks works out to Rs. 400 & Rs. 500 as per Alt.I & Alt.II respectively as shown in Table-III.

ADVANTAGES OF STABILISED SOIL BLOCK TECHNOLOGY

Use of Local Materials & Local Skills: This facilitates involvement of people in the construction of their own houses and thus aids decentralisation of construction process.

Economic Character: As seen earlier, stabilised blocks are cheaper than bricks.

Energy Efficient: Replacement of burnt bricks by 4% cement stabilised blocks will lead to a fuel energy saving of 60%.

Ecological Character: Processing of brick is a major source of pollution and also leads to ecological imbalance. These can be avoided by use of stabilised soil blocks.

Susceptibility to Seasonal Changes: There is a shortage of bricks during & immediately after the monsoon period as the switching on of production takes time. On the other hand, soil block production can be started at a short notice.

Thermal Comfort: Earth houses are climatalogically more compatible to live in.

Better Appearance & Aesthetics: The blocks have better size & shape as they are machine made.

STRATEGY TO POPULARISE SOIL BLOCK TECHNOLOGY

Inspite of the established technology, stabilised soil block have not really found favour in the housing programmes in India which are dominated by brick & concrete. Construction technologies being adopted by the Govt sector are largely based on these materials due to the inherent resistance of the Govt departments to go in for new materials & technologies as these require more initiative,effort,time & dedication. At the sametime,People usually like to follow the methods & materials being used by the Govt departments. This calls for efforts to encourage Govt departments to assimilate such new concepts in their working so as to set an example for People to follow.

As a first step towards promotion of soil block technology, Punjab State Council for Science & Technology (PSCST) is motivating the Department of Rural Development (Construction Wing) to undertake the construction of some buildings such as Panchayat Ghars, Schools, Veterinary Hospitals etc. in the villages as demonstration projects so that the local people can see for themselves the quality & durability of the material. The Council is providing to this department, Mobile Soil Block Machines free of cost as an incentive alongwith training programmes for the use & up-keep of the machine. A feedback mechanism would also be integrated in the project to further refine the technology. Bases on the results of these pilot projects and the responsiveness of the people, these machines would be provided on lease basis to a group of village panchayats so that people can use them for construction of their own houses/ buildings. This would facilitate acceptance of the technology and its widespread use in the rural areas.

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TABLE III: COST OF SOIL BLOCKS

ITEM	COST FOR 1000 BLOCKS	
	Alternative I	**Alternative II**
DIRECT COSTS:		
Soil 2.25 m^3 @ Rs. 15/m^3	Rs. 33.80	--
Cement 4%, 3 Bags @ Rs. 80/- per Bag	Rs.240.00	Same as Alt.I
Diesel @ Rs. 3.56/litre	Rs. 38.00	
Labour:		
1 Operator @ Rs. 40/day 4 Unskilled @ Rs. 25/day	Rs. 46.70	
(A) TOTAL DIRECT COST:	Rs.358.50	Rs. 358.50
INDIRECT COSTS:		
Depreciation & Interest on Capital	0.00	Rs. 113.30*
Repair & Maintenance	Rs. 20.00	Rs. 20.00
(B) TOTAL INDIRECT COST:	**Rs. 20.00**	**Rs. 133.00**
TOTAL COST (A) + (B) =	**Rs.378.50**	**Rs. 491.80**
	Say Rs. 400/-	**Say Rs. 500/-**

*Depreciation Cost $= \frac{3,50,000 \times 1000}{3.433 \times 9,00,000} = 113.30$

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Infrastructure for low-income communities
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Innovative techniques for low-cost rural housing

Prof. M M Tamakuwala, Prof. N C Shah and Ms B B Jokhakar

ABSTRACT

The need for integrated development of rural areas including the necessary infra--structure, such as roads, water supply, electricity, primary education, health, etc. in addition to the provision of house sites was emphasised by the conference of State Ministers of Housing and Urban Development of their meeting held at Madras. The housing problems needs serious considerations. The housing situation in rural areas is still more grave because of neglection of rural hous--ing over a period of years.

Surveys made by the United Nations and the specialized agencies to acertain prev--ailing housing conditions in the world show with minor exceptions that they are so unsatisfactory that extraordinary steps must be taken within reasonable time in order to master the situation. It has been estimated that the present shortage of housing in the country is 34.7 million. At the present rate of increase in population of the country as well as the present rate of construc--tion of housing shortage will swell to 50 million dwellings by the year 2000. The yearly production of dwellings is presently estimated at 8 millions. It would be possible technically to control the situation if, during the present decade, the production could be increased to an average of 12 million dwellings per year and thereafter for each decade be further accelerated so that between 1990 and 2000 the production will be about 25 million dwellings. This gigantic problem posses a serious challenge to planners and construction engineers to reduce construction costs and to use the limited resources in the most economical way.

In this papers authors have made an attempt to discuss the factors influencing building cost and to put forward some appropriate techniques for reducing building cost for low cost rural housing so as to meet the evergrowing demand.

INTRODUCTION

Now-a-days, low cost housing has become a crying need in almost all developing countries. Increase in population, indust--rialisation and urbanization, migration of more low income people to cities, increase in cost of construction material etc. are the factors that contribute to this very situation. Different efforts are being made by all developing countries to tackle the problem in differ--ent ways. The planning design research and construction of low cost houses for developing countries are taking place according to the needs and performance requirements of the occupants.

Very rrecently it has been observed by the world bank that poor people are becoming poorer and their number is increasing day by day. Dwelling facility even for a very poor man is essential requirement of his life. Especially in our country cost of basic building material is increasing day by day. There--fore it is a challenge to every civil Engineer, Architect and Technocrat of the country to think seriously on this aspect so that utmost desire of common man having his own house is satisfied in his life period.

It is difficult to generalise the defini--tion of low cost. The cost of building depend upon many aspects such as (i) Cost of land (ii) Basic material used for construction (iii) Rate of skilled and unskilled labourer and auxilary facilities such as water supply and sani--tation. Low cost can be defined as lower--ing overall cost as compared to alternatives available of a comparable quality. Moreover it also depends upon the optimum utilization of the land and local material, employment of locally available skilled and unskilled labourer and mode of design or design approach.

Philosophy of Low Cost Housing:

Central Building Research Institute has devoted its almost entire effort over last about 40 years to solve this problem. The approach had been mainly as under.

Materials: The philosophy which is being adopted by CBRI to reduce the cost is in savings on materials where they are not needed particularly in a section of the roofing and use of alternate material like lime, flyash, agricultural and industrial wastes in place of expensive and vital building materials without affecting strength and durability of the

finished product.

Speed of Construction: The conventional construction of a horizontal component for shuttering, requires considerable time in erection and curving period while with prefabricated component this time is saved to a large extent. This accelerates rate of construction considerably.

Standardisation:The design of house are being standardized for different plinth area and for different categories of users with emphasis on modular construction.

BUILDING COST REDUCTION TECHNIQUES

The various techniques contributing the reduction in the cost of a house are (i) Planning and Design, (ii) Selection of materials (iii) Construction Technology (iv) Construction Management & (v) Cost Planning.

Planning & Design:

Apart from the fact that building must be designed according to the functional requirements, several aspects of planning have a direct impact on its cost such as - planshape, size of building, circulation space, storey height, area of opening and number of storeys. Structural design influences the overall cost of a building considerably. By the use of latest theories of design, the cost of a structure can be brought down.

Selection of Materials:

In any dwelling unit, the cost of building materials is between 50% to 70% of the total cost. It is therefore quite clear that the reduction in cost of any dwelling unit would largely depend on economy in use of materials and use of locally available materials in preference to scarce and costly materials. In the name of durability, the relatively affluent section of the rural population has of late started using to a great extent cement and steel, many times out of proportion. As a nation starving for its development it should be our policy to see that use of cement and steel where it can be substituted should be discouraged. For example the use of clay with good binding properly and lime can be tried in place of cement for reducing constructing cost of building. Another area where economy can be achieved is the services, the cost of which can vary from 10% to 20% of the cost of a building.

Construction Technology:

Application of appropriate technology in construction works is an area where planners can play an effective role in reducing the cost of a building. Obsolete technology though often liked by some of the planners prove costly and it is time consuming, this may be due to lack of faith and lack of fair trial of the new technologies developed in the country. Another factor which is more important while selecting any specification/material or construction technique is that the cost should be seen both in short as well as in long term perspective. A technique or specification economical in the first cost but consuming more maintenance cost may prove costly in long run.

Public works are generally executed on contract basis by open competitive tendering. There are different types of contract e.g. measurement contract, lump sum contract and cost plus fee type of contract. It is also felt by the builders, architects and engineers in the field that there is a prime necessity to formulate a need based contract term with equitable conditions of contract for smooth running of a project which will ultimately result in savings in time and reduction in cost.

Construction Management:

To deal successfully with many difficult and complex management problems, the management is required to ensure judicious allocation and efficient use of resources i.e. the management aims at making the best use of all the resource. Modern management techniques like CPM and PERT are vital tools for timely and economical completion of projects.

Cost Planning:

Adequate control of expenditure is a prerequisite for successful completion of any project, whicj requires for accurate forecasting of construction estimates and comprehensive planning in the early stages of a project in order to avoid variations, deviations etc. which play havoc during execution. For this computer aided estimating for accurate and rational forecasting of the project cost is necessary. The problem of cost over-runs can also be effectively checked by monitoring the progress of work along with frequent cost checks on the pre-allocated cost to each element through a process technically known as cost-planning technique.

RECENT DEVELOPMENTS IN CONSTRUCTION TECHNIQUES FOR RURAL HOUSE

In rural areas, the vast majority of houses are made of mud walls and thatch roof. A number of such houses collapse during rainy season due to erosion of the walls. To protect the walls from

moisture penetration, and prolong their life, CBRI, Roorkee has developed a technique called 'Plinth Protection of Mud Walls' where burnt clay brick wall is built around the mud wall for a height of 60-75 cm. above ground level. The joints in the brick work are pointed with cement:sand mortar 1:4.

To protect mudwalls from weathering, non-erodable mud plaster, prepared by mixing bitumen cutback to ordinary mud-mortar can be used. The treatment is non-erodable, water repellent and durable. It provides safety against the collapse of walls in rainy season. The fire-resistance of existing thatch roof can be improved by applying a layer of non-erodable mud plaster over its top surface, after suitable strengthening measures of the supporting structure to carry the extra loads are taken.

Thatch is the most commonly used roof in rural areas. However, being of organic origin, it is susceptible to natural weathering, vulnerable to insect attack and fire. CBRI has developed a new mwthod of laying thatch roof by using manually pressed thatch panels and making it water-proof and fire retardant by applying non-erodable mud plaster over it.

Due to absence of any drainage system in rural areas, the water from the house is generally discharged in the streets making them unserviceable and creating unhygenic conditions. CBRI has developed a system to dispose off waste water coming from kitchen and bath. The waste water is first passed through silt and ash trap chamber, where the heavy particles are setted down and floating particles are trapped in the next chamber filled with brick ballast. The clean water is disposed off in a bore hole.

Disposal of night soil through underground sewerage or in septic tank is not feasible in rural areas due to their high initial and maintenance cost. Pit type latrines with hand flush type seat is found most appropriate and economical for rural areas. CBRI has developed a suitable design for low-cost latrines.

RURAL HOUSE SPECIFICATIONS:
To minimise the overall cost of a rural house, the general specifications of the common type of rural house may be as follows:

Foundation Concrete:

It may be 15 cm. thick and of any one of the following:
(a) Mud concrete with kankar of brick ballast. (b) Simply well compacted kankar or brick ballast in the presence of required quantity of water. (c) Weak cement concrete of 1:6:12 with brick ballast. (d) stabilised soil with about 33% brick ballast of 40mm nominal size well graded with 1% cement or other stabilised soil. (e) Lime concrete 16:32:100 with brick ballast.

Foundation and Plinth:

The foundation and plinth may be any one of the following:
(a) Stabilised soil rammed mud wall with 3% to 5% cement laid in situ. (b) Stabilized soil with cut back asphalt. (c) Second class brickwork with 1:3 lime mortar. (d) Second class brickwork with 1:8 cement mortar. (e) Cement concrete hollow blocks with 1:1:10 (cement:lime:sand) mortar.(f) Burnt brick or stone in mud mortar.

Damp-proof course (D.P.C.):

It may be one of the following:
(a) Two coats of asphalt painting. (b) 2 cm. thick 1:2 mix cement mortar with required water-proofing compound. (c) 2.5 cm. thick 1:2:4 cement concrete with required water-proofing compound.

Superstructure:

It may be one of the following:
(a) Stabilized soil rammed mud wall with 3% to 5% cement. (b) Burnt brick or stone in mud mortar. (c) Second class bricks in lime mortar. (d) First class bricks in lime mortar. (e) First class bricks in 1:6 cement mortar. (f) Cement Concrete Hollow blosk masonry in 1:1:10 (cement:lime:sand) mortar. (g) Stabilized soil brick with premoulded stabilized soil bricks laid in stabilized soil mud mortar. (h) Precast concrete solid blocks in lime flyash mortar. (i) Precast concrete wall units.

Door, Window Frames:

It may be any of the following materials :
(a) First class brick work laid in 1:4, Cement: Sand mix. (b) Precast cement concrete. (c) Locally available timber. (d) Stone. (e) Steel rolled sections.

Lintels:

It may be one of the following materials: (a) Stone. (b) R.B.Work. (c) Precast R.C.C. (d) Locally available timber.

Roof:

It may be one of the following:
(a) Slopy roof with A.C. sheets over wooden structure. (b) Slopy roof with Mangalore tile, Allahabad tiles, or similar other tiles laid over wooden structure. (c) Country tiles laid over

bamboo jafri and ballies. (d) Slate roofing supported over wooden structure. (e) stone slabs laid over wooden structure. (f) Brick tiles laid over wooden structure. (g)Jack arch roofing. (h)R.B. roofing.

Flooring:

It may be one of the following:
(a)Mud flooring with gobri lepping. (b) Moorum Flooring with gobri lepping. (c) Flag stone flooring.(d) Flat Brick flooring. (e)Brick on edge flooring. (f) Lime concrete flooring. (g)Cement concrete flooring. (h)Soil cement stabilizedflooring with gobri lepping.

Plastering and finishing:

It can be any of the following type, depending upon the type of walls and roof: (a)Stabilized soil rammed walls Stabilized soil brick walls,shall be plastered with 12mm. thick water proof mud plaster or with soil cement plaster. (b)No further treatment shall be required over precast concrete solid blocks, cement concrete hollow blocks, precast concrete wall units. (c)All types of brick masonary walls should be plastered with 1:6 (cement:mortar). (d)Walls of kitchen bath, latrine and cattle shed should be plastered with 10 to 16mm thick 1:6 cement,sand,mortar upto 60cm. to 100cm. height from floor level.

Doors and Windows Shutters:

These shall be made with local timber with ordinary steel fittings.The shutters may be of battened or panelled type.

Sanitary Fittings:

PRAI type or pit latrine fitted with glazed stone ware soil pipe, water traps etc. shall be provided. Pucca open drains shall be constructed in the courtyards, and all other places as per requirements.

CONCLUSION

Low cost construction does not necessarily mean low quality. It only means pruned specifications as against conventional specifications. Considerable R & D work has been done and a large number of economical and efficient building materials and construction techniques have been developed by various research organisations, their application in the building industry has not been to the desired extent. Engineers and builders have a great role to play in popularising the new techniques developed by research organisations. By the use of traditional materials and construction methods alone, it will not be possible to construct houses and other buildings at a pace to match with the ever increasing demand.

In fact low cost housing is a challenge to high calibre engineering. Search for new innovations and materials and development of simple processes for their utilisation should be our constant endeavour.

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Infrastructure for low-income communities
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PLENARY SESSION 3
Rural infrastructure

Discussion on Papers

RURAL INFRASTRUCTURE

Chairperson:
Shri K V Krishna Murthy Hyderabad

Co-chairperson:
R W A Franceys
WEDC
Loughborough University of Technology

Papers presented:

M ASADUZZAMAN
Minor irrigation: access to farmers.

Dr M E INCE
Health, Development and Infrastructure.

A C McINTOSH
The family handpump scenario.

Dr M MANSELL
Rural housing in Zimbabwe.

M D SMITH
Infrastructure for Palestinian refugees.

N S SODHI & J SINGH
Soil blocks for rural housing.

Prof M M TAMAKUWALA, Prof N C SHAH & Ms B B JOKHAKER
Innovative techniques for low-cost rural housing.

DISCUSSION

M ASADUZZAMAN

1. Mr PRASADA RAO (Director, Small Industries Service Institute, Hyderabad) asked about access of small farmers to irrigation systems in Bangladesh. Mr Asaduzzaman's paper concluded that medium and large farmers had greater access than small farmers to irrigation systems in Bangladesh. An explanation for this was needed. It was not clear whether the small farmers had a reputation for defaulting, or that the government did not subsidise irrigation programmes.

2. In reply, Mr ASADUZZAMAN stated that a detailed study is required to assess the irrigation water requirements of small farmers. Purchase of any irrigation equipment is difficult for poor farmers. (The minimum cost for a hand tubewell, rower pump or other manual pump is approximately Tk 2000.) Small farmers therefore prefer to purchase water, not irrigation equipment. Donors, however, have imposed the condition on the government that irrigation equipment, rather than water, should be sold to the users for irrigation. There are also areas where the hydrogeological conditions are such that low-cost irrigation equipment is ineffective. Purchase of deep tubewells necessary for irrigation in such areas is not financially feasible for small farmers. Mr ASADUZZAMAN suggested that donors should modify their conditions, be more generous, and agree to the sale of irrigation water instead of irrigation equipment.

3. Ms DAW (National Association of Water Resources Development Agencies, Pune) asked what measures were being taken to establish legislation in the use of ground water for irrigation and domestic purposes. Water legislation is important because water is a natural resource, populations are growing, and the use of chemical fertilisers is increasing.

4. Mr ASADUZZAMAN cited the 'Groundwater management ordinance', which was promulgated in Bangladesh in about 1984. For judicious use of a natural resource such as water, the requirements of such ordinances should be followed. The main features of this particular ordinance are:
a. Minimum distance between two deep tubewells to be 2500 feet.
b. Minimum distance between one deep tubewell (2 cusec) and another shallow well (0.5 cusec) to be 1700 feet.
c. Minimum distance between two shallow wells to be 800 feet.
d. To install any deep well or shallow well, the interested groups or individuals should procure a licence from the Upazila Parishad (administrative unit at the local level).

5. Mr THAMPURAN (Superintending Engineer, Kerala Water Authority) enquired as to whether any study had been made of the impact of high pumping rates (especially in summer) on groundwater and, if so, what the effect was.

6. Mr ASADUZZAMAN replied that weekly and monthly measurements of groundwater levels are taken to detect and monitor any fluctuations in level. No mining of groundwater has been detected in Bangladesh except around Dhaka City.

7. Mr THAMPURAN (Superintending Engineer, Kerala Water Authority) also asked whether water for irrigation, requiring large volumes, had been in any way linked to the provision of potable water.

8. Mr ASADUZZAMAN mentioned that an experimental system exists in the village of Shashibadan in Bogra, where a single deep tubewell provides water both for irrigation and rural water supply. Several water supply points have been installed, along a system of buried distribution pipes, to meet domestic water needs.

9. Mr THAMPURAN (Superintending Engineer, Kerala Water Authority) referred to conditions in Kerala, where considerable numbers of smallholdings are owned by small-scale farmers. A system of 'community irrigation' was tried, using a single source to irrigate areas of between 5 and 10 hectares shared between 20 to 50 families. This scheme was used for irrigation of vegetables and cash crops such as coconuts and betel nuts. The programme was halted as a result of financial constraints and poor motivation. Mr THAMPURAN enquired as to whether similar schemes had been tried in Bangladesh.

10. Mr ASADUZZAMAN said that he had no experience of similar schemes, but that landowners within the command of a tubewell grow vegetables as cash crops. There is an element of risk in that growers will not receive adequate payment if the production of a crop exceeds the demand.

Dr M E INCE

11. Miss ZACHARIAH (Socio-economic Unit, Kerala Water Authority) suggested that a third factor, accessibility, should be added to the two mentioned (quality and quantity). In her experience, accessibility has a significant effect on the quality and quantity of water. Water of good quality may be so distant that it cannot be carried in sufficient quantity. Alternatively, water of poor quality may be used, on the basis of taste, in preference to good-quality water close at hand. Finally, the yield from sources of good quality may be insufficient, such that users supplement their supplies from more distant sources of poorer quality.

12. Dr INCE agreed that accessibility (or convenience) was of importance, but she equated accessibility with quantity. Increasing quantity almost always occurs only when sources are located close or closer to people's dwellings, thus reducing the collection time and increasing both the volume used and, hopefully, the health status. Health education is important in promoting the use of better quality water (for drinking etc.) when there are either taste preferences or insufficient supplies close by.

13. The problem of jaundice was raised by Mr THAMPURAN (Superintending Engineer, Kerala Water Authority) who requested a modus operandi for tackling jaundice. Mr THAMPURAN stated that jaundice is spreading rapidly in under-developed countries, mainly through faecal pollution (contaminated water, insanitary conditions, insanitary habits). The situation, while worst in urban areas, is also affecting rural areas of Kerala. The importance of the disease, which may be attacked and controlled both preventatively and curitavely, is generally ignored, while large sums of money are spent on other health programmes such as cancer.

14. In reply, Dr INCE was in agreement that prevention (such as containing excreta and/or preventing it from contaminating water supplies) is better than cure. This policy is the best solution against jaundice, polio, diarrhoeas and many of the infectious diseases common in underdeveloped countries. How the money is spent may be determined in different ways, especially politically, and will vary markedly between countries and states. The modus operandi should really be integrated development.

15. Mr SHAH (Gujarat Water Supply and Sewerage Board) offered two comments.
a. Health education packages are needed for different water supply programmes and projects. The most important factor is to involve the community to monitor water quality themselves. Baseline and longitudinal surveys are needed to monitor the benefits of a project.
b. The integrated approach for water supply should include: - construction; - health education; - sanitation; - community participation; and - income generating activities for women.

16. Dr INCE thanked Mr SHAH for emphasising these points, most of which were included in her paper.

A C McINTOSH

17. Dr FUREDY (York University, Toronto, Canada) expressed shock at the lack of women and sociologists at the Asian Development Bank, and wished to know how the ADB plans to integrate more women consultants in addition to those for 'Women in Development'. Dr FUREDY also stated that she would like to see more women engineers, and would be eager to join any meeting or network to promote involvement of women in waste management.

18. In reply to these comments, Mr McINTOSH stated that the ADB both employs women consultants and has a 'Women in Development' specialist on the staff. There are many women engineers in the Philippines and Indonesia. Mr McINTOSH agreed that involvement of women in waste management is needed, and considered it to be an interesting subject that he would draw to the attention of the ADB's Environmental division.

19. Mr NARSIMIAH (Water Development Society, Hyderabad) noted that data suggests that the groundwater table is falling steadily. He suggested that promoting the use of family handpumps would contribute to the falling water table, accelerating the fall because of wasted water. This would create water shortages in the future.

20. Water use by family handpumps, as Mr McINTOSH emphasised, is insignificant when compared to the water abstracted by motorised irrigation pumps from deeper wells. Deep wells, used for irrigation, are the main reason for the falling water table. In addition, significant volumes of water are not usually wasted from family handpumps.

21. Dr DAS (UNICEF, Calcutta) suggested that a self-help effort to grow quick-growing plants inside family compounds for use as firewood was very important. He commented that donor countries and agencies had not encouraged such a programme in any significant way, and asked Mr McIntosh what importance he attached to the growth of plants for use as firewood.

22. Mr McINTOSH agreed that more should be done to encourage growth of plants for firewood, and that there was a need for communication to market the idea socially. Growth of fuel plants could be part of integrated rural development, and donors would be likely to support such programmes if they were suggested by governments.

23. Mr LANE (WaterAid, Nepal) had a question about the practicality of providing family handpumps in a given community. He said that family handpumps present a radical and exciting challenge to donor agencies, who currently concentrate exclusively on community handpumps. The costs per head are much higher for the family handpump, so that not all members of the community could afford one. Mr LANE asked how the remaining households could be covered.

24. Mr McINTOSH admitted that the costs of a family handpump would often exclude the poorest families in a community, who could not own one. Full coverage would only be possible with subsidies from governments or other donors. He suggested that the family handpump is not a universal solution, but may address a particular demand for those people who would like to help themselves and can afford to do so. Poorer people would continue to use the community well, community handpump, or other traditional sources.

25. Ms RAHMAN (Orangi Pilot Project Research and Training Institute, Karachi) asked a series of questions seeking more details of the family handpump programme, design standards, use of community resources, and problems experienced.

26. In reply, Mr McINTOSH explained that there has been no implementation to date, but that funding for pilot projects was being sought.

27. Dr MAHAPATRA (UNICEF, New Delhi) suggested that a word of warning was necessary, because pollution can, in certain instances, be a major concern with shallow handpumps. This problem is most significant in urban slum areas, peri-urban areas and areas of high water table. In such areas, and when developing rural infrastructure, water should be rendered safe before consumption, and any technological interventions need to be emphasised.

28. Mr McINTOSH stressed that the problems of pollution must be emhasised by the NGO facilitator in the social marketing of handpumps. He added that drainage is very important; and that interventions such as filtration, boiling of water and moringa seed coagulation need to be emphasised when dealing with polluted wells.

29. Dr MAHAPATRA (UNICEF, New Delhi) also commented that the paper and presentation implied a top-down approach: that the idea had been conceived and then implemented. This seemed to contradict the author's stated principle of planning from the bottom. Dr MAHAPATRA suggested that the contradiction was unintentional, adding that development has to be two ways and participatory. Push and pull approaches must be used to achieve the desired objective.

30. The push and pull approaches must merge, Mr McINTOSH agreed. The beneficiaries should be educated and enlightened as to what is possible and desirable: but the facilitators should also listen to what the people want and why. Social marketing should therefore not be ignored, because it is part of the whole development process.

31. Ms JONES (Llewelyn-Davies Planning, London) made a comment leading into questions. She was both surprised and pleased to hear the presentation; not only because as an anthropologist and urban planner she welcomes greater acceptance and understanding of the role of sociologists, but also because she thought that an even more important question was being raised, namely that poor people need to be (and should be) regarded as a client group whose needs, aspirations and requirements should be addressed. This is an issue which should concern engineers as well. There is, Ms JONES said, also the worrying issue that international agencies such as the World Bank are now focussing on more strategic, less 'human' aspects of institution building. The questions are therefore:- how acceptable or widespread are the author's views within the ADB? and how many ADB-funded studies for the future propose involvement of sociologists and/or anthropologists at the start of projects?

32. Mr McINTOSH answered by saying that the issues of poor people, their needs and aspirations are often addressed nowadays under an element of a project known as 'poverty alleviation'. He nevertheless believed that this will always have low impact unless poverty alleviation is made the subject of the project. Use of social scientists as consultants is quite prevalent now in the ADB, but more could be done in that field. This could be achieved both by using more social scientist consultants, and by having staff within the Bank having professional qualifications and experience as social scientists.

33. Mr NARAYAN (Consultant, Pune) noted that dignity and prestige were listed among the stated advantages of the family handpump programme. He was concerned that public health engineers may create psychological differences between neighbours if family handpumps were to be promoted on the basis of increased dignity and prestige. Mr NARAYAN preferred to view public health projects from the health aspect, and suggested that the advantages of family handpumps should replace 'dignity and prestige' with 'relief from the dangers of waterborne diseases'.

34. Mr McINTOSH drew attention to the fact that the list of advantages associated with family handpumps included 'better health', which includes relief from the dangers of waterborne diseases. Dignity and prestige are important in the uplift of people from poverty, and are strong reasons given by the people for wishing to own a family handpump. Mr McINTOSH agreed that, in social marketing, dignity and prestige should not be expounded as the reasons for obtaining a family handpump.

35. Mr THAMPURAN (Superintending Engineer, Kerala Water Authority) sought advice on the question of handpumps suitable for use in Kerala, where there are very large numbers of open wells, many being privately owned. Most of the wells lack linings or protection, and are polluted by spilled water and run-off flowing back into them. In addition, there have been several accidents when women and children have fallen into the wells. Mr THAMPURAN asked whether

suitable handpumps for such wells could be obtained, and whether wind-powered pumps could be used. He considered that handpumps would need a horizontal pipe to offset the delivery of water from the area immediately around the well.

36. Mr McINTOSH explained that the well is usually covered over when a family or community handpump is installed. The cover to the well should be so designed that excess water is channelled away, to prevent both pollution and pooling of stagnant water. Offset pumps are used (in the Philippines), and these help to prevent pollution, but they have a vertical pump operation, without the horizontal element mentioned by Mr THAMPURAN. Mr McINTOSH mentioned that safety is a genuine reason for installing a family handpump.

37. Mr THAMPURAN (Superintending Engineer, Kerala Water Authority) also asked whether any study had been made of cross pollution from a latrine to a shallow tubewell or open well. Such problems could be expected in the more densely populated villages, and there have been problems in Kerala even when wells and latrines are from 30 to 50 metres apart. During the rainy season the water table is very high; and liquids drain from the latrine pits during the summer.

38. Studies of groundwater pollution from latrines have been made. Mr McINTOSH explained that the safe distance between a sanitary latrine and a nearby well depends on the nature of the soil, but a separation of 10 metres is usually quite safe. The problem of high groundwater or flooding in low-lying areas is another matter, for which careful design of both latrine and apron around a well is necessary to prevent pollution.

39. Mr MUKHOPADHYAY (Water Supply Division, Calcutta Municipal Corporation) commented that the rural poor, especially in Asian cities, may be too poor to afford adequate food, so would be unable to purchase a family handpump. He suggested that government and public institutions may be more willing to fund community handpumps, which encourage cooperation within the community of users.

40. Mr McINTOSH stated that, in his opinion, the family handpump is a logical next step beyond the community well or handpump in the development process. There will certainly be poor people who cannot afford it, and for such people the community well or handpump is more appropriate. The fact that 40% - 60% of families interviewed in four of the study countries already owned their own well or handpump indicates that the family handpump is affordable to many rural people.

41. Mr KRISHNAMURTHY asked whether PVC handpumps were hygienic, because he had been led to believe that PVC is not totally inert and can act as a breeding ground for bacteria.

42. Mr McINTOSH was not aware of this opinion, and said that he would welcome any supporting literature. He did note, however, that PVC pipes are widely employed for water supply purposes throughout the world.

43. Mr PRASADA RAO (Director, Small Industries Service Institute, Hyderabad) referred to conclusions indicating significant demand for family handpumps in Asia, and that the scope of a handpump project should include income generating elements in an integrated package. He understood that there could be a number of income generating elements within a household having access to water from a family hand pump, but that these would depend on the family capabilities. No rigid elements were obvious, and he asked for clarification of the integrated income generating projects possible in a family hand pump water project.

44. Mr McINTOSH suggested that income generating elements may include a vegetable plot, chicken rearing, a piggery, etc. Facilitation by a 'grass roots' NGO is important in order to give the beneficiaries ideas of what is possible.

Dr M MANSELL

45. Dr BORGHEI (Sharif University, Tehran) raised a matter for consideration by both Dr MANSELL and Mr SODHI, to which Dr MANSELL replied. Dr BORGHEI stated that a recent earthquake in Iran had killed 50 000 and left 500 000 homeles. The idea of low-cost housing would therefore be meaningless unless proper attention were addressed to make the houses resistant to natural disasters such as floods and earthquakes, which are common in developing countries.

46. In reply, Dr MANSELL stated that earthquake resistance can be provided in low-cost houses, for example by incorporating concrete ring beams at eaves level. He added, however, that earthquakes are not common in Zimbabwe.

47. Mr PRADHAN PRATULLA (Ministry of Housing and Physical Planning, Nepal) asked whether the author believed in learning from what already exists. If so, he wondered whether a study of only 200 families could be used effectively to improve the rural housing situation.

48. Dr MANSELL said that he believed that it is necessary to start with what exists, and that trying to make too great a leap will lead to failure. He conceded that the survey may not have been statistically watertight, but it nevertheless gave an idea of people's feelings.

49. Mr SOMESHWARA RAO (Executive Engineer, Government of Andhra Pradesh, Hyderabad) asked what willingness the people of Zimbabwe had shown in accepting the new options for building materials. He suggested that acceptibility cannot be assured unless some public buildings were also constructed using the new materials; and asked what incentives can be used to encourage use of new materials.

50. In reply, Dr MANSELL remarked that the main problem for acceptance of new materials is their acceptance by building standard authorities. The present regulations are based mainly on European regulations for urban areas. Until these regulations become more flexible it is difficult to encourage rural people to adopt new materials. He added that there was, nevertheless, widespread interest in these materials.

M D SMITH

51. Mr SUGDEN (Austrian Relief Committee, Peshawar, Pakistan) noted that the problems of full VIP latrines in Palestinian refugee camps had been clearly described, and asked what solutions to the problems had been identified.

52. The question, Mr SMITH suggested, should be considered from both technical and social aspects. There are technical limitations on what can be removed from a pit by a suction tanker. Wet and fresh excreta can be removed, provided that the pit depth is not excessive, and that vehicle access is possible. Removal is much more difficult when the pit contents are dense, dry and compacted. Manual excavation is more suitable under these conditions. There may be social objections to the excavation of excreta from pits, yet there will usually be some people willing to attempt the work. A suggested procedure for introducing a pit-emptying programme is to establish the present methods used for emptying latrines, and any relevant social or cultural attitudes. From the local knowledge obtained, education and implementation programmes can be developed with the aims of adopting a safe emptying system and convincing people as to its safety.

N S SODHI & J SINGH

53. Mr RAJADURAI MICHAEL (WaterAid, Tiruchirapally, India) commented that training and organisation to marshall human resources should form the basis of development, and described his experiences of successfully producing soil blocks with Sri Lankan repatriates in the Nilgiris. He also emphasised the need for having an education and training component in programmes both to disseminate information to the people and to ensure adequate operation and maintenance of infrastructure facilities.

54. Mr SODHI expressed agreement with these views. Production costs would be reduced if a manual press were used. In most parts of the Punjab, labour is in short supply, whereas at the same time semi-skilled people are available in the villages. It was on this basis that PSCST recommended the use of a mobile soil plant. Education and training formed an integral part of the training, as was noted in the paper.

55. Dr MANSELL (University of Zimbabwe, Harare) wished to know the cost comparison between soil blocks and local burnt clay bricks, and whether these blocks had been accepted by the local Buildings Standard Authorities.

56. Mr SODHI referred to data provided in the paper, which showed that the cost per thousand soil blocks was within the range Rs 400/-to Rs 500/-. This compared to the cost of about Rs 800/- per thousand burnt clay bricks in and around Chandigargh (Punjab). From this it may be seen that the cost of soil blocks is approximately half the cost of bricks. As regards the acceptance of this technology, Mr SODHI stated that the Bureau of Indian standards (ISI) accepted soil based blocks as long ago as 1982, and had published Indian standards specifications for them (IS:1725).

57. Dr MAHAPATRA (UNICEF, New Delhi) asked whether the soil blocks would work out to be cheaper than burnt clay bricks in every part of the country, and whether they could replace bricks in the linings of leaching pits for pour-flush latrines.

58. Mr SODHI mentioned that, as discussed in his presentation, an important consideration in the use of soil block technology is the availability of a suitable soil. The economic viability of soil block production is dependent on the quality of soil available locally in a region. Poor soil would need excessive treatment, and may therefore prove to be more expensive. Soil blocks, with a 1:3 plaster coating, may be used for lining leaching pits, in just the same way as for conventional burnt bricks.

59. Ms DAW (National Association of Water Resources Development Agencies, Pune) enquired about the implications of soil block technology on the ecosystem as a whole.

60. In reply, Mr SODHI made reference to the fact that the processing of bricks is a major source of pollution, and also consumes considerable amounts of energy. firing a single brick requires the fuel equivalent of one branch from a tree. About 20 million tons of coal is needed to bake 1 lac (100 000) of bricks. The smoke produced during burning also pollutes the atmosphere. By contrast, the energy consumption and consequent pollution caused by the production of soil blocks is minimal, because the process does not require any burning.

61. Prof SHAH (SV Regional College of Engineering and Technology, Surat) expressed doubts about the economic viability of producing soil blocks, because he stated that the average cost of burnt clay bricks was Rs 450/- per thousand.

62. Mr SODHI & Mr SINGH were not clear about the basis of the costs quoted (by Prof Shah) for bricks, but repeated that in areas around Chandigargh bricks cost about Rs 800/- per thousand. Block production would obviously be economically viable in this case. The economics will, however, vary from region to region.

63. Mr AMBIKAR (Executive Engineer, Government of Goa) asked for an indication of the approximate costs for houses of 30 square metres (plan area) in Punjab and Gujarat. He also wished to know whether the design of rural houses took any account of space needs for cattle, sheep, etc. and facilities for disposal of their wastes. If so, he asked what were the cost implications.

64. Mr SODHI replied that the question was not relevant to the subject, but indicated that the design of rural houses in the Punjab included provision of cattle sheds etc.

65. Mr THAMPURAN (Superintending Engineer, Kerala Water Authority) commented that papers presented had concentrated on planning and construction for rural services, and drew attention to the deteriorating conditions of existing infrastructure in many areas. Examples mentioned included mud houses, thatched roofs and rural roads. He suggested that, because of their meagre incomes and lack of access to new materials, the poor cannot repair their homes or delay their deterioration. Mr THAMPURAN then asked whether anyone had undertaken projects to renovate existing houses and roads, and suggested that there was merit in such projects.

66. Mr SODHI again commented that the question was not relevant to the subject of his paper.

GENERAL

67. Mr SOMESHWARA RAO (Executive Engineer, Government of Andhra Pradesh, Hyderabad) asked three related general questions, addressed to the chairman, concerning use of fuels.
a. As a deforestation crisis is faced, should the use of wood as a fuel be banned?
b. Should the use of fuel efficient 'Chulas' (cooking stoves) be encouraged by issuing them as part of an infrastructure development programme?
c. Should efforts be directed to producing good fuels from domestic wastes in vilages?

68. In answer, SHRI KRISHNA MURTHY, as chairman, suggested that: a. Social forestry could be encouraged as a possible means of producing cheap wood fuel. b. No comment. c. There is scope for community work to collect waste material to be made into fuel briquettes for village use. Work also needs to be done to produce cheap fuel from biomass.

69. Mr RAJADURAI MICHAEL (WaterAid, Tiruchirapally, India) made general comments about the drudgery experienced by poor women who collect water and fuel. He noted that poor women only need brushwood and prunings for their cooking, and only cook once a day. They only cut trees in order to earn a living by providing wood for those who are better off. Village woodlots could be encouraged, to supply all the needs of poor women. The water table is also dropping; in one village the water table has fallen from a depth of 12 feet in 1946 to 70 feet in 1990. The number of villages experiencing problems of water supply is therefore increasing, yet attempts at integrated watershed development have shown that the water table can rise once again. There is therefore an urgent need to cover the entire area of the country with an integrated watershed development policy. A comprehensive groundwater regulation act is long overdue.

Mr AMBIKAR (Executive Engineer, Government of Goa)
Mr ASADUZZAMAN
Dr BORGHEI (Sharif University, Tehran)
Dr DAS (UNICEF, Calcutta)
Ms DAW (National Association of Water Resources Development Agencies, Pune)
Dr FUREDY (York University, Toronto, Canada)
Dr INCE
Ms JONES (Llewelyn-Davies Planning, London)
Mr KRISHNAMURTHY
Mr LANE (WaterAid, Nepal)
Dr MAHAPATRA (UNICEF, New Delhi)
Dr MANSELL (University of Zimbabwe, Harare)
Mr McINTOSH
Mr MUKHOPADHYAY (Water Supply Division, Calcutta Municipal Corporation)
Mr NARAYAN (Consultant, Pune)
Mr NARSIMIAH (Water Development Society, Hyderabad)
Mr PRADHAN PRATULLA (Ministry of Housing and Physical Planning, Nepal)
Mr PRASADA RAO (Director, Small Industries Service Institute, Hyderabad)
Ms RAHMAN (Orangi Pilot Project Research and Training Institute, Karachi)
Mr RAJADURAI MICHAEL (WaterAid, Tiruchirapally, India)
Mr SHAH (Gujarat Water Supply and Sewerage Board)
Prof SHAH (SV Regional College of Engineering and Technology, Surat)
Mr SINGH
Mr SODHI
Mr SOMESHWARA RAO (Executive Engineer, Government of Andhra Pradesh, Hyderabad)
Mr SUGDEN (Austrian Relief Committee, Peshawar, Pakistan)
Mr THAMPURAN (Superintending Engineer, Kerala Water Authority)
Miss ZACHARIAH (Socio-economic Unit, Kerala Water Authority)

PLENARY SESSION 4:
Water supply and sanitation programmes

16th WEDC Conference

Infrastructure for low-income communities

Hyderabad, India 1990

Appraisal and evaluation: A new approach

George Akosa, Peter Barker and Richard Franceys

The ex post monitoring of the performance of investment projects in developing countries is critical to evaluation of future programmes. This paper proposes that the performance of a group of projects in a programme area may be compared using objective measures of their ability to deliver outputs relative to their usage of inputs. To this end non parametric productive efficiency measures are calculated for a variety of alternative water supply and sanitation projects in Ghana. The aim is to rank the projects in terms of their productive or technological efficiency, so that conclusions about their relative efficiency in performance can be reached. As Cost-Benefit Analysis is a useful tool in the ex ante appraisal of projects so the technique used here, Data Envelope Analysis (D.E.A.) is a valuable aid to the ex post evaluation of projects in operation.

Data Envelope Analysis (D.E.A.) and Productive Efficiency

D.E.A. measures the technical efficiency of firms, processes or projects. Each project can be represented by a point on an isoquant diagram. An isoquant shows all the technically efficient combinations of inputs (X_1 and X_2) which will yield a particular output level. Efficiency between inputs and output is represented by an isoquant and the problem is to identify the efficient isoquant. In figure 1 TT is the efficient isoquant in the sense that no firms produce a unit of output using fewer inputs than firms located on the isoquant. All points to the right of the isoquant represent projects which require more of at least one input to produce a unit of output.

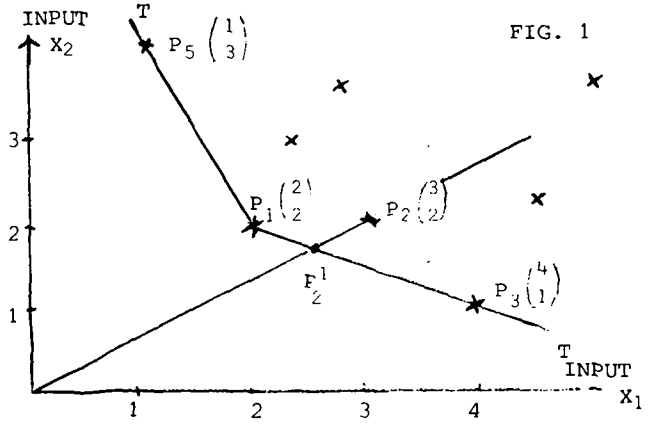

FIG. 1

P_2 has observed input requirements of 3 of X_1 and 2 of X_2 to produce one unit of output. P_2^1 uses the same ratio of inputs but is on the unit isoquant. This means P_2^1 would produce one unit of output producing less of each input. The ratio $OP_2^1/OP_2 < 1$ is a measure of the efficiency of the project P_2. The efficient processes P_5, P_1 and P_3 would score unity as they are efficient, located on the isoquant.

D.E.A. is employed to calculate the efficiency scores of projects which use several inputs and produce several outputs. Efficiency is defined as the ratio of the weighted sums of the outputs to the weighted sums of the inputs. For a project identified by the subscript 0, the efficiency score h_o is:

$$(1) \quad h_o = \sum_{r=1}^{s} Ur\ Yr_o \Big/ \sum_{i=1}^{m} Vi\ Xi_o$$

where, Yr_o = is the amount of the r^{th} output from project 0
Ur = the weight given to the r^{th} output
Xi_o = the amount of the i^{th} input used by project 0
Vi = the weight given to the i^{th} input
s = the number of outputs
m = the number of inputs

The object is to find the set of non-negative output and input weights (Ur, Vi) which maximise h. Choice of the weights is limited by the constraint that when they are applied to each process the corresponding ratios cannot exceed unity. Thus (1) is maximised subject to:

$$\frac{\sum_{r=1}^{r=s} Ur\ Yr_o}{\sum_{i=1}^{i=m} Vi\ Xi_o} \leq 1 \qquad o = 1 \ldots n$$

$$Ur, Vi > 0$$

Software suitable for personal microcomputer use is available which will solve h for each project.

Description of Inputs and Outputs

Application of the D.E.A. technique requires identification of output attributes associated with each project or process. The ultimate goal of improved water supply and sanitation provision in developing countries is the capturing of health benefits, the freeing of time for productive and leisure uses and generally reducing the drudgery and toil of water collection which figures so prominently especially in the life of women.

Three desirable output attributes were considered in this study, reliability of service, utilization of service and convenience to the consumer.

Reliability Output Factor This is measured as the fraction of time that the facility is operational R.O.F. = 1 - System Down Time.

Utilization Output Factor For water projects this was taken to be the fraction of daily water use from the improved source. For Accra water utilization was measured by population coverage. For sanitation the fraction of compartments available for use was taken for the VIPs. In the case of Accra Sewerage the fraction of time the system was fully operational was recorded.

Convenience Output Factor This was determined by population density. Densities were associated with different standards of service.

Production of clean water without high levels of consumption will not capture health benefits. Direct measurement of health benefits and their monetary evaluation have proved extremely difficult in practice so this study postulated that a supply service characterised by reliability, high utilization and convenience to comsumers would encourage consumption and consequently capture health benefits. The problem is to determine the technologies that most effectively deliver the output attributes.

Experience indicates that the success or failure of water and sanitation projects is determined by an amalgam of technical, financial, economic, social, institutional and environmental factors.

Neglect of one or more inputs at either the appraisal or evaluation stages may commend inappropriate and inefficient technology. The D.E.A. technique requires identification of relevant inputs and the selection of indicators which best capture the significance of each identified input. In this study the following inputs were selected as appropriate.

Technical input It was decided that the best single factor reflecting the technical complexity and dependency of the project on the scarce input foreign exchange was the foreign exchange component expressed as a ratio of the total capital cost. Important determinants of this input score are the technological sophistication and the method of financing the project.

Financial input This factor attempts to measure the cost recovery aspect of the projects. Cost recovery is defined here as the ratio of the actual annual revenue collection to the annual full cost of delivery of the service. Full cost is calculated as the annualised cost of capital and operation and maintenance expenditures at the 15% discount rate over a 20 year project life. The financial input factor is measured by the deficit on full cost. For projects on which the served community bears all cost, the financial input is zero. Where the community contributes nothing the input fact is unity.

Economic input Calculation of this factor required the separation of foreign exchange and local components of capital and the apportionment of labour input into skilled and unskilled. By this means and with the use of appropriate shadow prices the variability of quality of inputs is taken into account. To arrive at the economic resource cost the scarce inputs are multiplied by the appropriate shadow price conversion factors. Again, the annual economic cost per person per annum was determined for each project.

Institutional input The great diversity of the type and sophistication of the project technologies made for considerable differences in the institutional support demands of the technologies. The institutional input was measured by the amount of skilled manpower employed full-time to operate and maintain the water supply or sanitation project. The number so obtained was increased proportionately to provide the equivalent number of skilled personnel for an assumed population of one million.

Social input Considerable evidence exists which suggests that a precondition of project success in the developing world is a substantial degree of community participation. The social factor aimed to measure such factors as the degree of community involvement in requesting the service, the level of service desired, commitment to continuance of use and ability and willingness to pay contributions to cost recovery. Together these factors represent the issues central to effective community

participation. In this study community participation was split into elements of involvement. Elements recording negligible community involvement were scored one and high involvement zero. Summing element scores for each individual project yielded low scores for high community involvement and high scores for poor involvement.

Environmental input This factor measured the cost of elimination or reducing to acceptable levels any environmental problems associated with individual technologies. For the water supply projects the environmental problem considered was sullage disposal. The cost per person of effective disposal is the environmental input factor for water projects. For sanitation projects the environmental problem was associated with sludge disposal in the case of the K-VIPs and with final disposal of sewage in the case of the Central Accra Sewerage project.

Table 2 (appended) records the input and output factors calcualted as described above.

The D.E.A. Results and Interpretation

The computer solutions provided the following efficiency scores for the six water and four sanitation projects.

Table 1

Project	Efficiency Score
Accra + Tema Water	1.000
Borehole Water	.903
Package Plant Water	.978
2500 Drilled Wells	.530
3000 Drilled Wells	.223
Hand Dug Wells	1.000

Project	Efficiency Score
Central Accra Sewerage	.019
Urban K-VIP Latrines	.111
Rural K-VIP Latrines	.064
Traditional Pit Latrines	1.000

Of the water supply projects the most efficient are at the extremes of water supply technology. The technical sophistication of the Accra-Tema system absorbs large amounts of foreign exchange, skilled labour and institutional support. At present sullage disposal is inadequate and providing a satisfactory solution would impose a considerable environmental input cost. Some 60% of the total capital cost of this project was in foreign exchange. This is attributable to the mode of financing, by supplier's credits, and the complexity of the technology. Large urban water supply in Ghana necessarily requires a surface water source. Phase 1 of this project involved Volta River water 54 km to the west of Tema. The project required large capacity pumps, large diameter steel pipes plus other imported inputs. Moreover, the initial quality of raw water extracted meant that a full conventional treatment plant with consequent high foreign exchange requirements had to be provided.

However, the very high degree of reliability (97%) and utilization (80%) accorded the project top efficiency rating. The high level of utilization is attributable to the concentration of stand-pipes and the lack of alternatives, most traditional sources now being polluted or unavailable.

In technical contrast hand dug wells were equally efficient. This technology required modest levels of foreign exchange and no skilled labour. The foreign cost component of the well was only 25% but 90% of the handpump. The project had a high degree of community participation. More than 90% of all operation and maintenance plans were met on this project. In addition the project had no adverse environmental impact. Hand dug wells scored particularly on reliability (98% availability). Examination of the records showed that only 25 days of pump downtime occurred in 3 years. Even then water was available to the community by the simple expedient of a hatch, rope and bucket.

The 2500 Drilled Wells and 3000 Wells programmes fared less well, with efficiency ratings of .530 and .223 respectively. Both of these projects had considerable foreign exchange requirements and both used relatively little of abundant unskilled labour. In both projects the degrees of community participation were modest. The 3000 Wells project scored only .4 on reliability. By December 1988 only 40% were operating, moreover water quality problems have caused widespread rejection of well water and accounts for the low utilization score. Cost recovery has been poor as consumers have refused to pay for a low quality service from a scheme that was basically imposed upon them.

The weakness of the 2500 Wells programme has (5.0). The sparsity of the northern population means that in the rainy season traditional sources are nearer than the wells and people's perceptions of the health benefits are not strong enough to overcome the inconvenience of more distant location.

Of the sanitation systems the Accra Sewerage project is by far the most technically sophisticated but has a poor efficiency score (.019). Though the project scores well on reliability (.90) and convenience (200) the poor connection record means utilization is low (.20). For this sewered solution consumers were expected to provide their own internal plumbing and to pay the substantial connection cost. For the poor this has proved too much of a financial burden. Furthermore, the perception of benefits of improved sanitation is minimal among the affected population. Improvement of the connection rate would improve the poor utilization rate and a more adequate revenue collection system would improve the financial recovery which currently is only 12%. As a sanitation solution for a developing country the sewered system represents a high cost, inefficient solution.

The urban Kumasi type VIP is a community based system, it embodies relatively simple technology and is a non-sewered solution. Correctly operated and maintained such systems are capable of capturing the health benefits of much more technically complex solutions.

The efficiency rating of this project has been reduced by the modest utilization score (30%) which is mainly due to lack of capacity at peak times and the deterrent of recently introduced charges. Public health education would encourage higher usage if sufficient capacity could be installed.

The traditional pit latrine's technical simplicity allows it to be wholly provided by the served community and operated without external assistance. Together with use of local materials and labour this technology represents the most efficient sanitation system especially for populations who put little weight on aesthetics or privacy.

Table 2

	INPUT FACTORS						OUTPUT FACTORS		
PROJECT	Technical	Financial	Economic	Institu-tional	Social	Environ-mental	Relia-bility	Utiliz-ation	Convenience
Accra-Tema Water	0.60	0.73	2.43	479	6	2.0	0.97	0.80	150
Borehole Water	0.65	0.95	2.20	450	6	0	0.78	0.50	80
Package Plant Water	0.60	0.97	4.56	1000	7	0	0.33	0.40	80
2500 Drilled Wells	0.72	0.95	1.97	72	5	0	0.85	0.40	5
3000 Drilled Wells	0.84	0.99	4.42	66	6	0	0.40	0.30	70
Hand Dug Well	0.44	0.54	0.93	0	0	0	0.98	0.90	60
Central Accra Sewerage	0.46	0.38	77.60	1150	8	3.3	0.90	0.20	200
Urban K-VIP Lat.	0.50	0.31	6.77	0	2	1.0	0.90	0.30	100
Rural K-VIP Lat.	0.50	0.22	8.15	0	3	1.0	0.90	0.10	70
Traditional Pit Latrine	0	0	0.45	0	0	0	0.90	0.44	60

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Infrastructure for low-income communities

Hyderabad, India 1990

Drumstick seed as a coagulant

Dr P Pratapa Mowli

ABSTRACT

The results of investigation using drumstick seed power as a natural coagulant are reported. The raw waters used for experimental work encompassed turbidity values ranging from 32 to 210 NTU. and, PH values ranging from 6.5 to 9.1. The results of the work clearly indicate the effectiveness of the drumstick seed as a coagulant and compares well with alum for treatment of turbid waters. The findings of the work will be of immediate apllication in rural water supplies in the developing countries.

DESCRIPTION OF DRUMSTICK PLANTS AND SEEDS

The scientific name for drumstick plant is Moringaceae. It has several species. Most of them are grown in India, Africa, S. America and, many Asian countries. The author has investigated two species which are common in India and Ethiopia.

Moringa stenopetala is found in many parts of Ethiopia. The seeds for the experimental work were collected from Arba Minch, Konso and, Omoratte. Moringa oleifera is found in Errer Gota near Dire Dawa in N.E. Ethiopia. This is the species which is commonly grown in the backards of dwellings and gardens in South India. The fruit of this is commonly known as "drumstick", and is popular as a vegerable in S. India. The leaves are also used for making green-leaf curry, both in S. India and in Ethiopia. Both fruits and leaves are supposed to be good for heart and against diabetes.

The name "Moringa", is derived from the Dravidian (S. India) word "Morunga", which probably indicates the original home of the plant. The seeds of M. oleifera for the experimental work were collected from Error Gota (Ethiopia) and Bangalore and, Tirupati (S. India).

The trees of both species of Moringa reported in the paper grow to height of about 4 meters in 12 months from seeds and start giving fruits for seeds in 13 to 15 months. The height of the trees when fully grown may be 5 to 6 meters. Only the ripe fruits are suitable for removing seeds, for coagulation. If plants are manured and watered regularly, yield from each plant can reach 1000 fruits per year. The author has grown M. oleifera several times in the last 30 years and, M.stenopetala has been observed for about 2 years. Each fruit on average gives 8 good and useful seeds. The powder for coagulation is to be obtained from the kernels by removing the shell of the seed. The details regarding the weights of seeds and kernels are given in Table I. The useful life of Moringa trees of the above two species is expected to be 8 to 10 years.

EXPERIMENTAL SAMPLES

The water samples were collected both in dry and wet seasons from the river Kulfo, lake Abbaya and, lake Chamo; all within 10 km radius from the Institute. The raw water characteristics are given in Table II.

The drumstick fruits were plucked when fully matured and when showing symptoms of drying. Fruits were either dried in the sun or in shade. Table I gives the places, from where the fruits were gathered for testing. The seeds were removed from the fruits and dried in the shade for several days before using. Kernels from seeds were separated by ripping off the husk, just before powdering for use in the experiments.

TABLE I

MORINGA SEEDS, THEIR AVERAGE WEIGHTS AND USEFUL KERNAL WEIGHTS

Species	Sample from	Wt. Per seed	Wt. of Kernal	Wt. of Kernal as % of seed
M.stenopetala	Arba Minch (E)	590	500	84.57
M.stenopetala	Konso (E)	480	430	89.58
M.stenopetala	Omoratte (E)	380	320	84.21
M.oleifera	Errer Gota (E)	240	180	75.00
M.oleifera	Bangalore (I)	330	290	87.88
M.oleifera	Tirupati (I)	340	300	88.24

Note: E = Ethiopia; I = India

weight in milligrams and rounded to nearest 10

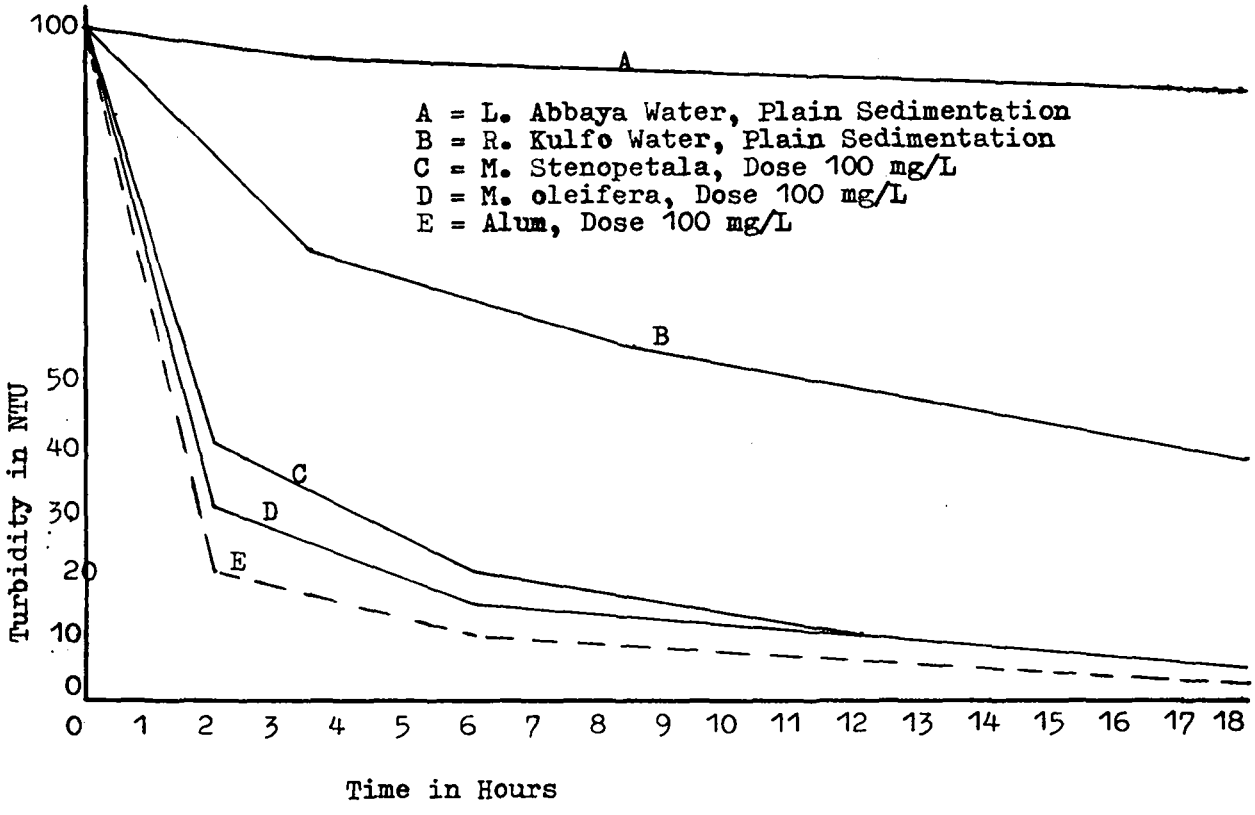

FIGURE I

RELATIONSHIP BETWEEN DOSE, TURBIDITY & SEDIMENTATION TIME

TABLE II

PARTICULARS OF RAW WATERS

Source	Turbidity range	PH range
River water (Kulfo)	32 - 210*	7.5 - 8.5
Lake water (Abbaya)	80 - 110	8.1 - 9.1
Lake (Chamo)	20 - 40	8.8 - 9.2

Note: Turbidity units are in NTU

* High turbidity values after rainy days

EXPERIMENTAL WORK

The Laboratory analysis was carried out in the Water Treatment Laboratory of the Department of Sanitary Engineering (Env. Engg.) of the Institute. The kernels removed from the seeds were powdered by using pestle and mortar of hard porcelain. Exact quantities of the powder required were weighed using glass weighing-boats on digital Electronic precision balance. Solution of the powder was made in volumetric flasks with distilled water partly filled. After thorough shaking for a few minutes, the balance of water up to the mark was added and shaken. This stock solution was used in the jar test experiments using Hach Floc-Tester. Hach Turbidity meter (Model 2100+) was used for measuring turbidities. Mixing was done manually for one minute and flocculation (slow-mixing) was done for 15 minutes by adjusting the time switch. Flocculation time of 10-15 minutes was found to be satisfactory through initial experiments by varying the times from 5 minutes to 45 minutes. The dose of the solution (containing powder) was added by pipettes and was varied from 20 mg/l to 300 mg/l. The PH adjustment when required was done by adding HCl. Observations were made at intervals to get detention periods from 2 hours to 20 hours. Samples for turbidity measurement were withdrawn by using pipettes fitted with suction bulbs.

RESULTS

The results of the experiments showing the relationship between Turbidity, Dose and Detention period, for powders of seed from Moringa stenopetala and Moringa oleifera, Alum are shown in Fig. I. Blank samples (plain sedimentation) are also plotted. No significant differences were observed between samples obtained from different places of the same species. Seeds of M. stenopetala are bigger and yield more powder. However, M.oleifera fruits are more tasty as a vegetable, and hence are recommended in places where they are used as a vegetable. The PH values of water in the range of 6.5 to 9.2 does not significantly affect the dose requirement of seed powder.

CONCLUSION

Drumstick plants can grow in most of the developing countries in tropics. The seeds can be harvested from the plants within a period of 12 to 15 months after showing the seeds. Two or three plants in the backyard will be adequate to supply enough seeds required for treating the waters. The seed powder is quite effective in removing the turbidities up to 300 NTU and up to a PH values of 9.2. A dose of 100 mg/l and overnight clarification are considered adequate for most of the waters to bring down the turbidity values to about 5 NTU. The drumstick seed powder is comparable to Alum up to PH value 7 and is superior at higher values and at lower values.

ACKNOWLEDGEMENT

The author is grateful to Comrade Alem Al-Azar, former Commissioner and to Comrade Aragaw Truneh, the present Commissioner of Ethiopian National Water Resources Commission for sponsoring the work.

The author also appreciates the interest shown by Comrade Ahmed Umer, former Dean, Engineer Girma Muluneh, the present Dean, and Ato Sahle Sisay, Deputy Dean of Arba Minch Water Technology Institute, Miss Emebet the lab technician assisted in the experimental work. My thanks are also due to Ato Gemechu for typing work.

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Water supply and sanitation: planning for the nineties

Rattan Kumar Siddhi

INTRODUCTION

1. The country of Nepal is surrounded by the People's Republic of China to the north and India to the east, south and west. Thus, geographically, the country is at a disadvantage in that it is a land-locked country with the nearest sea-port of Calcutta in India, some 500 km to the south-east (on the Bay of Bengal). Nepal is roughly rectangular in shape covering an area of 147,181 sq km. The terrain rises steeply from the Indo-Gangetic Plain in the south to the high Himalayan mountain range in the north (over a very short distance). Administratively, the country is divided into five Development Regions, fourteen Zones and seventy-five Districts. The average rainfall is 1,400 mm per year, which is mainly from the south-east monsoons. Because of the concentrated rainfall during the monsoon season (mid-June to mid-September), about 70% of the total runoff goes as instantaneous flow and the rest is conserved as snow and ground-water, ultimately appearing in the rivers in the dry season.

2. Demographically, Nepal has been witnessing some dramatic changes in the recent past. The present population is about 19 million, whereas the last census of 1981 reported the population as 15 million only. Modest projections indicate that the populations in 1995 and 2000 would reach 21 million and 23 million respectively. The urban population in 1952/54 was only 3% of the total population whereas in 1981 it rose to 6% and is presently about 10%. The pressures that this has brought about in infrastructure development, therefore, becomes quite evident.

3. The aim of this paper is to highlight the various activities that have been undertaken so far, in what may be termed, the preparation of the second decade plan for the sector - covering the period of the nineties - upto the year 2000 A.D. In response to the follow-up action recommended by the Regional Consultation on the International Drinking Water Supply and Sanitation Decade (IDWSSD) in New Delhi, India, from 18 to 22 July 1988 (ref. 1), an inter-sectoral Task Force has been set up by His Majesty's Government of Nepal (HMG-N), Ministry of Housing and Physical Planning (MHPP), to specifically review and analyse the present status of the sector and to formulate the sector programmes upto the end of this century (ref. 2). This exercise has been termed the Sector Review and Formulation of Sector Programmes upto the Year 2000 A.D. (SRFSP).

HISTORY OF PLANNED DEVELOPMENT IN NEPAL

4. Planned economic development in the country may be termed to be of very recent origin and was ushered in only after democracy in the early fifties. Prior to this, development activities followed no systematic approach and was more the result of the whim and inclination of the then autocratic Rana rulers. The First Five-Year Plan was launched in 1956 and covered the period 1956 - 1961. The development of the sector may also be considered to have truly commenced then. The next plan was spread over only three years. The following plans were all of five-year durations and the current Seventh Plan comes to an end in mid-July 1990. The next decade will be comprised of the Eighth and Ninth Plans. The following table shows the population served with drinking water supply during the past plan periods.

TABLE 1: Population served with Drinking Water

End of Plan	Total Population	Population benefitted			Total Coverage (%)
		Urban	Rural	Total	
1956(Before Plan)	8,813.0	206.9	74.5	281.4	3.2
First (1961)	9,413.0	306.9	108.8	415.7	4.4
Second (1965)	10,217.0	372.6	146.0	518.6	5.1
Third (1970)	11,319.0	461.1	185.8	647.0	5.7
Fourth (1975)	12,567.0	515.1	283.7	798.0	6.4
Fifth (1980)	14,620.0	714.4	862.0	1,576.4	10.8
Sixth (1985)	15,465.0	913.0	3,080.0	3,993.0	25.8
Seventh (1990)	18,921.0	1,260.0	5,930.0	7,190.0	38.0

(N.B.: Population figures are in thousands.)

5. It will be seen that the launching of IDWSSD nearly a decade ago did provide the much needed impetus to the development of the sector in the country. In retrospect, though the targets set then (ref. 3) may appear to have been rather ambitious, the Ten-Year Plan prepared then was the first long-term sector development plan of its kind. In spite of the fact that the achievement is only slightly more than half the target set for water

supply, the necessity of an inter-sectoral approach and the need for a renewed commitment from all quarters was fully appreciated. The shortfall has been shown in Table II below.

TABLE II: Seventh Plan Shortfall

Sub-Sector	Targets	Achievements
Rural	11830	5930
Urban	1270	1260
Total:	13100	7190
Percent	69%	38%

(N.B.: The above population figures are in thousands.)

INFRASTRUCTURE NEEDS

6. The needs of the low-income groups become paramount when considering the various issues related to infrastructure planning. While emphasis tends to be focused on the rural population where much of the people below the poverty line is concentrated, it has to be realised that it is the peri-urban population around the urban centres, where problems are more acute and must be addressed with greater urgency.

7. To a greater extent, the infrastructure needs of Nepal is tied up with the minimum basic needs programme covering food, clothing, shelter, education, health and security. In the national perspective, the prioritization of the sectors is for electricity, transportation, irrigation, health, communications, etc., before the water supply and sanitation sector. A much higher priority, therefore, needs to be accorded to this sector if the national objective of "water supply and sanitation for all by the year 2000 A.D." is to be realised. In the peri-urban environment, three other elements requiring immediate action are storm water drainage, sanitary sewerage and solid waste collection (besides roads, electricity and communications) (ref. 4).

SRFSP ACTIVITIES (ref.2)

8. The objectives of SRFSP have already been mentioned in the introductory section. This exercise has been initiated with financial and technical assistance of the World Health Organization (WHO) (under Project NEP CWS 001) with the active participation of the following concerned sector agencies:

- Ministry of Housing and Physical Planning (MHPP)
  : Department of Water Supply and Sewerage (DWSS)
  : Nepal Water Supply Corporation (NWSC)
- Ministry of Health (MOH)
- Ministry of Local Development (MLD)
- Ministry of Education and Culture (MOEC)
- National Planning Commission (NPC)
- Ministry of Finance (MOF)
- Social Services National Co-ordination Council (SSNCC).

9. The members of both the Steering Committee and the Task Force are top officials of HMG-N with the two WHO sanitary engineers and the Team Leader of the Management Information and Technical Support Project (MITS) as advisers. The Steering Committee is chaired by the Secretary, MHPP, and is responsible for monitoring and directing the Task Force. The Steering Committee has been so constituted that it would become the National Water Supply and Sanitation Committee (NWSSC), which is to be the apex body dealing with all matters related to the sector.

10. The assignment given to the Task Force requires that the following activities be undertaken:

- collection and processing of all available data and information on the sector with respect to completed, on-going and confirmed projects,
- preparation and holding of regional workshops for updating the above, estimation of expected coverage and determining water resources potential, appropriate technology, project proposals, operation and maintenance status plus problems and constraints,
- detailed analysis of the present situation of the sector covering all the above issues,
- formulation of the sector programmes upto the year 2000 A.D. including
  : realistic population projections, proposed population coverage, project proposal packaging,
  : policies, strategies, programmes, funding requirements, community participation, women involvement, sanitation and health education,
  : human resources development, structural readjustments in institutional/ organizational set-up,
  : individual district plans,
- documentation for external support (donors) agencies (ESA) meeting proposed sometime in the latter part of the year.

11. SRFSP overall exercise is envisaged to be completed within seven months. The first two activities have already been executed successfully. The organization of the Regional Workshops took longer than anticipated because all the five Development Regions had to be covered. The findings and recommendations of the Regional Workshops are dealt with in detail in the subsequent sections. According to the revised schedule,

Activity III is to be completed by the end of May 1990 and the entire work by mid- August 1990.

MEETING THE BASIC NEEDS OF THE PEOPLE: SECTORAL ISSUES (ref.5)

12. His Majesty, King Birendra, gave directives in January 1986 to provide all the Nepalese people with the basic needs already referred to. For meaningfully achieving the targets shown in Table III, the following issues will need to be given due consideration:

- Improvement in drinking water quality by establishing appropriate monitoring and surveillance networks. Treatment processes would have to be limited to simple chlorination units using bleaching powder - more emphasis being given to conservation and protection of water sources (ref.6).
- Major rehabilitation of treatment works and distribution systems in urban centres to be implemented not only to reduce unaccounted for water but to ensure 24-hour supply thereby avoiding pollution dangers that exist in the present intermittent supplies.
- Software components like active co-operation and participation of the beneficiaries, research and development of appropriate technical options, strengthening of the existing institutions and organizational restructuring.
- The Decentralization Act, 1982, entrusts the entire range of responsibilities from planning, resource mobilization, implementation and management of the completed projects to the local district and village level units. For the smooth enforcement of this Act, other acts as well as statutory rules and regulations exist. One such recent directive is the "Water Supply Project Construction and Management Manual, 1989". But there seem to be some inherent difficulties in this Manual as was repeatedly highlighted in the Regional Workshops and are discussed further in the next section.
- Other support programmes like human resources development, establishment of a proper management information system and a radically new approach to sanitation and health education activities.

TABLE III: Population Coverage Targets(1991-2000)(ref.7)

Plan Period	Population Coverage(x 1000)			Funding (in US$) (millions)
	Additional	Cumulative		
		Actual	%	
Eighth	7,190.0	14,770.0	70	269
Ninth	8,893.0	23,200.0	100	294
Total:	16,083.0	-	-	563

SRFSP FINDINGS (ref. 8)

13. During the course of the group work in the regional workshop, each district team consisting of the then District Panchayat President (DPP), the Local Development Officer (LDO) and the District Engineer (DE) listed issues and problems specific to the district with respect to the topics referred to above. Based on the proceedings of these four workshops, this section attempts at consolidation of the more pertinent and important ones which are summarised below:

- Population served as of mid-July 1990 needs to be further verified because the coverage figures of certain agencies are still estimates - specially in the case of grant-in-aid projects. The national coverage of 38% may, therefore, be too optimistic considering the fact that some of these schemes, in all probability, would be non-functional.
- The reorganization of the main sector agency - DWSS - has provided for permanent regional and district offices in all the seventy-five districts. However, all the sanctioned posts have not been filled up - specially in the case of both professional and sub-professional technical posts - resulting in inadequate supervision of construction works and inability to meet the supervision requests of other sector agencies.
- The annual budget ceilings made available to the districts are grossly inadequate and far below their requirements - resulting in an ever increasing number of projects with nominal budget amounts only.
- A huge credibility gap exists between the district water supply branch offices (DWSBO) and the beneficiaries because project completion periods have unnecessarily been spread over a number of years - whereas, with adequate budget, these could normally be completed in two years.
- It has been appreciated that the enforcement of the new MHPP directives (ref. 9) has brought about uniformity in the activities of the sector agencies. However, certain difficulties have been encountered in their implementation, viz.,

: not sufficient interest being generated in the communities for forming effective water users committees (WUC),

: WUCs have been found to be more effective in smaller schemes but a similar approach in very large schemes with a main system and a number of sub-systems, has not been found satisfactory,

: WUCs taking on the responsibility for the actual construction work (either contractual or otherwise) and advancing sums of money to them for such work has some inherent shortcomings (as far as ensuring

accountability is concerned),

: the personnel of the three district units (LDO, DWSBO and WUC) as well as the village maintenance workers do not have the required background and acumen (nor inclination) to work under the changed conditions requiring massive local-level resource mobilization,

- the unsatisfactory condition of completed schemes illustrate the failure in making them sustainable due to the absence of a suitable cost recovery mechanism.

STRATEGIES FOR THE NINETIES

14. This section is specially devoted to the numerous suggestions that came out of the discussions during the workshops referred to above. Since the two main activities of the SRFSP exercise still remain to be executed, it would perhaps be a bit premature to lay down some firm recommendations. However, it could be irrevocably stated that three issues stand out clearly. Our strategies for the nineties must, therefore, take them into consideration. These issues are project implementation procedures, human resources development and resource mobilization (both external and internal). The first two aspects will be further highlighted in this section. The third topic forms the subject matter of the next section.

15. Implementation Procedures - There is the urgent need to make a realistic assessment of the achievements with respect to population coverage. Based on this, pragmatic projections would have to made and targets for the future set accordingly.

- A national sanitation policy and related strategies will have to be developed before the beginning of the Eighth Plan dealing with the development of various low-cost options, full cost subsidy for the construction of institutional and demonstration latrines only and the full mobilization of Mothers' Groups at the grass-roots (in every ward of the village) for the promotion of individual house-hold latrines along with health education and women involvement.
- Creation of a congenial atmosphere whereby the annual sector programmes can be implemented in a sense of mutual trust amongst engineers, administrators and the beneficiaries. Maximum community participation and resource mobilization can only be achieved through regular interaction and intervention of the beneficiaries. It may be advisable to have representation from DWSBO in the WUCs and limit the latters' role to more of a management body (supervisory and monitoring). This body should ultimately function as a financially viable entity with a sound in-built cost recovery mechanism. This will have to be a prerequisite for ensuring the sustainability of any project.

16. Human Resources Development (HRD) - If the implementation procedures as conceived in the new MHPP directives are to be effectively and meaningfully implemented, the need to develop the necessary institutional capability at the village level must be given top priority. The district level institutions must also play a more dynamic role as it will continue to be the indispensable link between the villages and the centre. The major thrust must now be to take HRD to the district and village levels. The whole gamut of HRD - right from the planning, recruitment, proper placement including career development - are of equal importance. The first action that needs to be taken is the establishment of training units at each district and diversify the activities at the centre to provide training to trainers and the necessary logistic support. An accelerated programme to train WUC members and village maintenance workers must receive immediate attention.

RESOURCE MOBILIZATION

17. Though this appears last in the listing done above, this issue is in no way of least importance. Resource mobilization, in fact, is the crux of the problem and the success of all activities is dependent on it. With the targets which have to be achieved in 1995 and 2000 A.D., we are left with no other alternative but to devise a more pragmatic approach towards not only external but internal resource mobilization as well - including, of course, the community level. The adoption of appropriate technical options and implementation procedures have a direct bearing on both the money and material resources, as well.

18. The draft Eighth Plan document referred to above (ref. 7) has indicated the overall programmes for the sector and made tentative estimates of the costs involved. These have been summarised in the table below.

19. As compared to Table IV, the financial outlay during the Seventh Plan was only NRs. 2,197 millions (US$ 1.00 = NRs. 28.50). It will, therefore, be clear that the total investments for the sector during the next two plans would have to be as much 3.5 and 4 times respectively. This would require that HMG-N not only gives higher priority to the sector but also the level of funding would have to be appreciably increased.

TABLE IV: Targets and Investments (1995 and 2000 A.D.)

Implementation Programme	Popul. Coverage		Investment	
	Eighth Plan	Ninth Plan	Eighth Plan	Ninth Plan
1. Traditional Source Improvement	482.0	722.0	192.8	289.3
2. Shallow Tubewell (Handpumps)	3,623.0	3,051.0	200.6	130.0
3. Well Construction	200.0	300.0	100.0	150.0
4. Rural Piped Water Supply	2,245.0	3,720.0	1,683.7	2,790.0
5. Urban Piped Water Supply(Major) (Minor)	500.0 140.0	800.0 500.0	2,250.0 210.0	2,700.0 750.0
6. Urban Rehab.:Water Supply(NWSC)	-	-	2,006.0	-
7. Rural Rehab.:Water Supply	-	-	100.0	200.0
8. Sanitation	-	-	27.3	35.9
9. Sewerage	-	-	175.0	200.0
10.Support Programmes	-	-	390.0	364.9
11. Administration/Management	-	-	356.6	500.0
Total:	7,190.0	8,893.0	7,690.0	8,110.1
Grand Total:	16,083.0		NRs. 15,100.0 (US$ 563.0)	

(N.B. Population figures are in thousands and investment figures in millions NRs)

20. Table V gives the agencywise breakup of the targets and the investments that will be needed both for the Eighth and the Ninth Plans.

Table V Agency-wise Targets and Investments

S. No.	Agency	Eighth Plan		Ninth Plan	
		Target	Investment	Target	Investment
1.	MHPP: Rural Urban	1,624.0 64.0	878.3 4,466.0	5,143.0 1,100.0	1,437.5 3,450.0
2.	MLD: Rural	2,145.0	1,170.0	2,270.0	1,913.8
3.	NGO: Rural	357.0	127.8	380.0	208.9
4.	Total:	7,190.0	6,643.1	8,893.0	7,010.2
5.	MHPP: Sanitation/ Sewerage	-	202.3	-	535.9
	Other Support Programmes	-	8,844.6	-	564.0
	Grand Total:		7,690.0		8,110.0

(N.B Targets are additional population served in thousands and investments are in millions NRs.)

CONCLUSION

21. As was mentioned in an earlier section, only two SRFSP activities have so far been carried out. These have, however, confirmed without doubt the important issues and areas that will need more thorough consideration during the course of the next two steps. The detailed analysis of the data and other information gathered is currently underway. This will form the basis for the sound formulation of the sector programmes leading upto the district development plans for all the seventy-five districts of the country. In the actual implementation of the proposed programmes, many more challenging opportunities will come our way. For those of us who are fully committed to the development of the sector, our involvement in this noble task will not only be most satisfying but also a continued source of inspiration.

ACKNOWLEDGEMENT

22. The assistance that has been rendered to the Task Force in the smooth implementation of the activities till now as well as the guidance and advice received from all the members of the Steering Committee and Task Force in the preparation of this paper is duly acknowledged. The co-operation and encouragement that has been forthcoming from all quarters also deserve our sincere gratitude.

Best of All Things is Water for, indeed,
Water is Life!

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N.B.

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2. Disclaimer: The views expressed above are not necessarily those of HMG-N or WHO and neither have these necessarily been endorsed by them.

16th WEDC Conference

Infrastructure for low-income communities

Hyderabad, India 1990

Integrated infrastructure development

Robert A Boydell and Wendy Quarry

INTRODUCTION

This is not a paper about sophisticated urban planning models but about trying to achieve a balance in the planning of water supplies and environmental sanitation in villages and small towns.

Background

Over the past decade the emphasis in water and sanitation infrastructure development in villages and small towns in India has been on the provision of public stand post and handpumps to provide a minimum basic service level of 40 litres capita per day (lcpd) in order to provide equitable distribution of scarce resources. The construction of pour flush water seal latrines in order to relieve scavenging (that is, the emptying of bucket latrines) has also been considered as having a high priority, although implementation has been limited. Other environmental improvements have not been stressed.

At the end of the Water Decade where do we stand? The Government of India has made tremendous strides in providing water to the majority of the problem villages identified at the beginning of the Decade and is adopting a policy of decentralization and the handing over of these water systems to local authorities. However, after visiting a number of villages and small towns in various states that have benefitted from Government's accelerated rural water supply program one leaves with mixed impressions.

The Existing Situation

Let us look at a hypothetical village or town of about 15,000 in which the state water board has recently constructed a piped water scheme tht was subsequently handed over to the local authority for them to operate and maintain it. The scheme was designed on the basis of 40 lcpd and one public standpost per 250 people. Water is taken from a nearby river and treated in a small plant consisting of a rotating bridge clariflocculator and pressure filters.

The village committee or Gram Panchayat which has recently adopted the scheme see it as a source of revenue and have allowed the richer villagers to have private connections. The scheme which originally had 60 standposts now has an additional 120 private connections which has overwhelmed the system's capacity and the poorer villagers in the periphery only have a trickle of water twice a day for about an hour.

The existing traditional wells continue to be used despite their unsanitary arrangements particularly by the villagers in the periphery, during the day when the new systems do not work or when the new scheme has gone out of order or the power supply fails.

Walking through the streets it can clearly be seen that by providing the village with a new water system, a second problem has been created. The problem of drainage. Because the area is flat and the soils impermeable, spillage from standposts and some old handpumps combine with the additional sullage or grey water generated inside the households from increased water use to form streams that flow through the village streets and lanes.

One cannot help but note the contrast between the immaculately clean household courtyards and the streets in which the storm drains are choked by solid wastes which has allowed the sullage to form stagnant ponds in which flies and mosquitoes are breeding.

When we move into the back streets we can see a number of pour flush latrines which were supplied in a donor driven project, the majority of these latrines are abandoned but some are used for storing cycles and cement.

Also in the back streets to the rear of some of the richer households we see small family sized gobar gas (biogas) plants that were provided some years ago by Khadi Village Industries. Approximately half of these are still working and provide

energy for lighting and cooking, the other are abandoned because the domes have rusted and because it was perceived that the efforts of operating the plant did not justify the rewards.

A visit to the water treatment plant reveals that the motors for the alum paddle mixer and the flocculator bridge have burned out and the pressure filters only work intermittently because of the electricity cuts.

The visit to this hypothetical village results in a meeting with the village leader the Sarpanch. He explains his perception of the village's priority needs; these are, water first and drainage second. Schools, clinics and roads are also high priorities, however, latrines are at the end of his list.

The Need for an Integrated Design Approach

The example given above may well be extreme but it serves to illustrate that when planning the infrastructure in villages and small towns there is a clear need to take a holistic approach and consider the interlinkages between water supply and environmental sanitation in its broadest sense, and not to only consider standposts and latrines. At this point we should consider in more detail the design criteria, and linkages between some of these components of village and small town infrastructure.

Water supplies; although inspired by concepts of equity the approach of adopting basic norms in public supplies do not work well. If the richer can afford to pay for a better standard of service why should schemes not be designed to accommodate this. If properly priced and regularly collected, revenue becomes available: to cover all or part of the capital costs; to cross-subsidize basic minimum water supply for the poor; supports expansion and operation and maintenance of the system; ensures sustainability of the system and does not break any equity principles.

Rehabilitation of traditional water sources; within water and sanitation projects the incremental costs of improving and protecting existing water sources is small. However, the potential benefits are large in terms of health improvements. It is clear that communities return to their traditional sources when new schemes fail (if they ever abandoned them). Placing an apron and collar around and open well and installing a handpump can dramatically improve the water's quality by eliminating ropes and buckets.

Drainage and sullage; clearly when a new or much improved water supply is brought to a village increased water consumption will take place resulting in sullage and spillage being generated. In flat areas with impermeable soils this creates a major health problem because of insect breeding. Arrangements for dealing with sullage and spillage should be integral components of water supply schemes.

Storm drainage; clearly there is a link between sullage and storm drainage. Our look at the hypothetical village revealed that the sullage and spillage water eventually found its way into the storm drains that line the main road in the village. These drains which were constructed by the roads department who channelled them to the village pond which is now becoming polluted and foul. The design of storm and sullage drains has to be considered together.

Excreta disposal; supply and target driven latrine building projects do not work. The only effective projects are those in which a demand has been created through social marketing or promotion and education campaigns and where the delivery mechanisms and markets have been established to serve the demand once it becomes effective.

Solid wastes; solid wastes are clearly a problem. Vegetation and other wastes which are disposed of indiscriminately, finds its way into the drainage channels where it causes blockages and adds to the pollution. The disposal of solid wastes could be linked with the emptying of pit latrines and the wastes composted outside the village to provide valuable humus. However, composting and marketing the products is a complex process and few long sustained successful examples are seen. Biogas like composting has its faithful proponents, however the long term technical and financial viability of these plants has not been fully demonstrated.

However, the need for appropriate technology should not be forgotten. The water treatment plant would have been much more robust with a flume mixer, hopper bottom sedimentation tank, and slow sand filters rather than the electricity dependent "high tech" equipment that was used.

Integrated Projects-bringing it all together

It has become more clear in recent years that for projects to be successful there is a need to involve the beneficiaries in this planning and implementation. However, strategies for doing this are not well understood nor is it an easy task. One method of involving people in the planning and decision-making process is to stimulate

awareness of the environmental situation in which they live and the needs for improvement. One technique has been for the community to develop village maps which indicate where people live, the position of wells and standposts, polluted and flooded areas and to draw up an inventory of required improvements.

A second important consideration is developing an understanding of the communities' ability and willingness to pay for services, both capital and operations and maintenance costs. Recent studies have shown that communities are willing and able to pay a great deal for a high level of service, but conversely people are not willing to pay for poor services. This implies that by providing better services Government can reduce its financial burden. In order to recover costs, schemes should be designed to provide good service and be extendable as and when required. (Ref 1).

A further consideration is the packaging of project components so that the higher priority components provide leverage with which to introduce other interventions. Also the packaging and phasing of communications and implementation of physical works is critical. Donors and Government should resist pushing target driven "supply" projects and should concentrate on creating demand and creating market mechanisms to serve this demand; low cost sanitation is a good example of this.

Projects should also fully deal with the community's perceived needs and not create secondary problems. For example standposts and handpumps should not be provided without adequate drainage.

All of this hinges upon the project authorities establishing a good rapport with an understanding of the communities of the project area. That is developing communications with people - this is discussed in the paper "Communications in Infrastructure Developments" to be presented by Ms. Quarry.

Institutions - bring them all togehter

Bringing it all together at the community or project level is one issue, however, a second problem to be faced is coordinating the numerous responsible institutions. In the typical village situation we examined it may well be that the state water board is responsible for water supplies; the department of rural development for sanitation; the department of health for extension and hygiene education and the public works department for roads and drainage. A number of NGOs could be active in the area plus the town or village has a council which represents the interests of the residents. Each of these agencies have their own budgets and work programs which may be conflicting, overlapping.

An important concept in integrated infrastructure planning that is embodied in decentralized government is the identification of local nodal agencies which are responsible for coordinating development. Furthermore, an important tool for coordination is the preparation of detailed development plans at the lowest practical level. District, block or town/village plans that are contributed to by the different responsible bodies and agencies are a sound basis for developing coordinated approaches to integrated infrastructure development.

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Low-cost sanitation programmes - Orangi

Ms Perween Rahman

1. THE PROBLEM OF KATCHI ABADIS:(1)

The urban crisis in Karachi has many aspects, but perhaps, the most dangerous aspect is the growth of katchi abadis. At the beginning of this decade, according to KDA estimates, there were 362 katchi abadis (unauthorised settlements) in Karachi. Now there are more than 450, and most probably in the coming years there would be many more.

The emergence of katchi abadis is caused by powerful economic and social trends, which first appeared with the industrial revolution, and are now moulding the developing countries in Asia or Latin America. It is a problem whose manitude has grown with each decade in Pakistan.

2. FROM BULLDOZING TO UPGRADING:(2)

At first our planners thought that they could get rid of the katchi abadis by bulldozing them and settling the squatters in official colonies like Korangi and Landhi. But the number of squatters grew enormous and the capacity to build colonies dwindled. Moreover, the squatters acquired political clout on account of their numbers. While most of them could not be settled in official colonies, neither could they be bulldozed with impunity. Bowing to the doctrine of necessity katchi abadis were to be regularized and upgraded; our planners had to follow international precedents.

3. THE DILEMMA OF UPGRADING:(3)

Upgrading means providing the same facilities to the katchi abadis as are provided to the affluent quarters, of the city - roads, piped water, electricity, and above all sanitation and underground sewerage.

Upgrading is necessary and urgent for many reasons: first, of course, is the human reason, the imperative of social justice. Secondly, as international experience has shown, it is dangerous to have large and neglected slums which may become the breeding ground for class conflicts. The early migrants may be docile, but their children are militant.

However, the conventional cost of these facilities is quite high specially of sanitation and underground sewerage. Official and commercial agencies can realise the cost from solvent customers, but cannot do so from low income settlers.

The hope of optimistic planners to upgrade katchi abadis with foreign loans ignores the fact that the beneficiaries cannot repay the cost.

4. THE KATCHI ABADI OF ORANGI:(4)

Settlement in Orangi began in 1965. After 1972 it grew rapidly, at present extending over seven to eight thousand acres, and housing (according to popular estimates) one hundred thousand families. It is still growing. The settlers bought land from dallals (touts), and built houses without any government help.

The majority belong to the lower classes - labourers, skilled workers, artisans, shopkeepers, vendors, clerks, etc. There is a sprinkling of middle class enterpreneurs and workshop owners. Sample surveys indicate that the average monthly family income is around one thousand rupees.

The population includes Mohajirs (old immigrants from India), Biharis (Urdu speaking immigrants from East Pakistan - now Bangladesh), Pathan immigrants from the Northern areas, immigrants from Punjab, and local Baluchis and Sindhis.

5. ECONOMIC AND POLITICAL STRUCTURE:(5)

Familiarity with Orangi reveals that a population as large as that of Gujranwala, Colombo, Amsterdam, etc., receives scanty services from official agencies.

The people of Orangi depend mainly on "informal" (often underground) sources. Land is obtained through dalals; credit, material and advice for housing is obtained from thallawalas (block manufacturers). Self supporting private schools and coaching centres teach their children; private doctors and quacks(physical and spiritual) treat their ailments. They continuously resort to the black market and the bribe market for business facilities or welfare amenities or peace from harassment.

That this huge informal sector and its black market is many times the size of the formal or official sector indicates the weakness of government planning for the poor.

At the same time it indicates the vitality of the poor themselves and their skill in the art of survival.

Besides their vitality is demonstrated by the presence every where of "anjumans" and "associations" which lobby intensely all the time, presenting claims and guarding gains.

It is further demonstrated by the growing consciousness, specially among the new generation, of their collective vote power and street power.

6. ORANGI PILOT PROJECT (OPP):(6)

OPP as an NGO began to work in Orangi in April 1980.

OPP considers itself a research institution. Its objective is first to analyse outstanding problems of Orangi and then, by prolonged action research and extension education, discover possible solution.

OPP itself does not construct sewerage lines or set up welfare clinics or schools or industrial homes etc. It promotes self-finance and self-management. By means of research and extension it tries to change attitudes so that the practice of cooperative action may grow among the Orangi residents.

OPP publishes a quarterly progress report in English and Urdu bulletins, which contain financial statements and quarterly and cumulative tables of work. Besides numerous monographs and case studies are also published.

Since 1980, the following action research programmes have developed models of community participation and management:

1. Sanitation (started in 1981).
2. Housing (started in 1986).
3. Basic health education and family planning (started in 1985).
4. Women's work centres (started in 1984).
5. Education project (started in 1986).
6. Economic programme for family enterprises (started in 1987).

At present OPP has been upgraded into four permanent institutions. The sanitation programme is now a part of the Research and Training Institute.

7. CASE STUDY OF THE LOW-COST SANITATION MODEL:(7)

OPP has applied the Research and Extension technique to evolve a model of low cost sanitation - self built, self financed and self managed by the house owners.

The sanitation and sewerage problem in the katchi abadis presents a dilemma. OPP has demonstrated that it can be resolved by mobilising local resources - social, managerial and financial.

a) R & E approach in agriculture:

Research and Extension has been extremely successful in the case of small farmers. Its assumptions are:

1. The small farmers can and should manage and finance their own farms.

2. But departmental assistance should be provided to them in three respects:

   - Research e.g. improved methods and implements, HY varieties, plant protection, animal husbandry etc.

   - Dissemination and demonstration of research findings to small farmers (extension).

   - Provision of adequate and reasonably priced (sometimes even subsidised) services and supplies.

The position of low income house owners in a katchi abadi is analogous to the small farmers and therefore the above assumptions can be valid in their case too.

b) R & E for low-cost sanitation:

OPP has successfully tested the approach and its assumptions to introduce a sanitation system in many sectors of Orangi.

There are four levels of a modern sanitation system:

1. Inside the house - the sanitary pour-flush latrine.

2. In the lane - underground sewerage lines, manholes, and house connections.

3. Secondary or collector drains.

4. Main drains and treatment plants.

OPP found the house owners willing to accept the responsibility of constructing and maintaining the sanitary arrangements at the first three levels with their own finances and under their own management like the small farmers.

The first three levels constitute 80 to 90% of the system. The main drains and the treatment plants must remain, like main roads and water lines, the responsibility of a central authority.

c) Cost reduction and mobilisation through R & E:

The house owners accepted the responsibility for the construction of the sanitation system because the cost was drastically reduced through R & E.

Research consisted in:

1. Simplifying the designs.
2. Surveying and mapping.
3. Preparing standardised steel shutterings.
4. Writing instruction sheets, posters etc.
5. Preparing models, slides and audio visual aids.

Extension consisted in:

1. Finding activists in the lanes.
2. Training lane managers and mistris.
3. Providing accurate plans and estimates.
4. Loaning tools and shutterings.
5. Social and technical guidance and supervision.

d) People's investment in low-cost sanitation:

July 1981 to March 1990

Head	No.	Lgt/Rft	Cost/Rs	Houses
Sewerage lines	4176	1046255	14324340	64495
Secondary drains	328	429667	1555754	
Sanitary latrines	64495		32247500	
			48127594	
			US$ 2291790	

The R & E approach drastically reduced the cost and widely mobilised the local managerial and financial resources.

OPPs investment in R & E from July 1981 to March 1990 has been

Rs 2.8 million as compared to peoples investment of Rs 48.12 million a ratio of 1:17.

But if we calculate according to conventional contractor's rate which is six times the peoples rate. Peoples investment in sanitation comes to over Rs 288 million and the ratio of expendi-ture on R & E to peoples investment comes to 1:100.

The sewerage lines and the sanitary latrines built with their own money, and under their own management are being maintained by the house-owner at their own cost. There has been no need for a revolging fund and no expensive botheration about recoveries and defaults.

e) Other impacts: socio-economic

i) **Impact of underground sanitation on health and environment:**

In Orangi bucket latrines and soakpsits were being used for the disposal of human excreta, waste water flowed in the lanes. Poor sanitation was damaging health, poor drainage was causing waterlogging and thus damaging the value of property.

Through sanitation programme, people saw clearly, the cause of damage to their health and property. With 4176 lanes out of 6247 having underground sewerage lines, the environment is now clear of filth. Health survey shows that 70 percent diseases have been controlled.

ii) **Change in attitude/awareness/community spirit:**

With sewerage lines laid in lanes, an informal association have developed among the lane residents.

People's attitude have changed. Confidence that problems can be solved by themselves is manifest in further steps towards development. Thus, roads have been laid in the lanes by the municipality, and garbage disposal has improved by 25 percent, 14,036 rft. of open drains built by the municipality has been converted into underground sewerage. People have become aware of higher standards of sanitation.

iii) **Women's role - increase in economic activity:**

Women have realized that inspite of social bindings they can participate in development. They have shown this in sanitation by undertaking motivation, money collection and maintenance. With this confidence they are increasingly joining the economic activities.

f. Upgrading OPP into a Research and Training Institute:

In 1988, the Planning Commission, Government of Pakistan evaluated the sanitation model. It recommended that OPP be converted into a Research and Training Institute, with Orangi serving as a demonstration. In 1988, OPP/RTI was registered. Presently, research and training is being undertaken to duplicate the model.

g. Extension outside Orangi:

Since 1988, assistance is being extended to organisations outside Orangi, who desire to duplicate the sanitation model. OPP/RTI's role is to train, impart technical advise, and monitor. In four katchi abadis work has been undertaken in 16 lanes, meaning 1603 rft. Peoples investment has been Rs 49,478. At present work is in progress in 2 more katchi abadis.

8. CONCEPT OF PARTNERSHIP IN DEVELOPMENT:

The lesson learnt from the sanitation programme is a concept of development of katchi abadis, with people and government as partners. Orangi has shown that people can be mobilized to finance, manage and maintain a modern sanitation system at the internal level. The external development has to be the responsibility of the government. Thus, reducing government expenditure and extent of implementation, making recovery possible (8).

Time frame and targets:

While comparing the time required for mobilization and the targets, Orangi shows that the first lane in 1981 took six months to mobilize but today out of the 6347 lanes in Orangi 4176 (66 percent) lanes have an underground sewerage line self-financed, managed and maintained. Today no effort is required to mobilize.

Orangi itself had no precedent but for other settlements Orangi serves as the demonstration.

9. QUESTION OF REPLICABILITY:

With the success of the model in Orangi, efforts are being made for its replication.

There are two ways in which it can be replicated: 1) as a policy of the government, and 2) through NGO's and Community Action Groups (CAGs).

The issues related to the above are:

The government's attitude:

There is lack of acceptance of the concept of partnership. The attitude of patronage is ingrained having its roots in our feudal structure.

This attitude does not match with the development needs. The result is duplication and ill-planned development (often based on political patronage) alienating the people.

The NGO's, CAG's attitude:

Influenced by government's attitude it takes more time to organise people for self help. An added disadvantage is the attitude of the NGO's who are more welfare or lobby orientated. Their attitude needs to be orientated towards development (through empowering people with knowledge).

10. CHANGES REQUIRED:

Changes required at the:

- **Government's level:** acceptance of the concept of partnership, leading to a change in policy and the institutional structure.

- **NGO's level:** understanding of the R & E approach.

- **CAG's level:** changing from an approach of welfare and lobby to self help.

11. EFFORTS BEING MADE:

Setting up of the RTI:

We are focussing attention on establishing the Research and Training Institute to extend our model outside Orangi. Manuals, audio-visuals, monographs and reports have been prepared. Training of groups has become a regular activity. RTI's role is to train, monitor and document.

Training:

Contacts have been established with groups in the government sector, NGO's, CAG's as well international agencies which send members for training.

Bulletin:

A quarterly bulletin is published in local language for extension to groups in Pakistan.

12. DIRECTIONS FOR FUTURE:

a) **Replication:**

To undertake research and impart training at all three levels. Response is encouraging from the NGOs and CAGs.

b) **Demonstration models in Orangi:**

To continue programmes in Orangi which serve as demonstration.

c) **Research/networking:**

To develop on understanding of the development issues and alternatives.

Footnotes

1 to 7-a & b are excepts from the monograph. Case study of OPPs low-cost sanitation programme by Dr. Akhtar Hameed Khan.

8. For details on the concept see report "Proposal for Development" evaluation of Asian Development Bank financed Karachi Urban Development Programme, April 1989. An OPP publication.

16th WEDC Conference
Infrastructure for low-income communities
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Performance of small sewage works in Tehran

Dr Mehdi Borghei

INTRODUCTION

United Nations figures indicate that more than 70 percent of world's population live in countries known as "developing". They vary a great deal in aspects such as economic status and per capita income, technical capability, education and rate of illiteracy, nutrition and other markers which explain the degree of "developing". However one familiar characteristic, common to most of them, is over population in cities which can not provide them with basic necessary services. Mexici city, Cairo, Amman and Tehran are good examples. Rapid increase in population over relatively short period of time has created situations where proper sanitation is often non-existant and safe water supplies is out of reach for the poor.
Tehran is a city where one out of every six Iranians live there,with nine million people. Fortunately the water supply for its inhabitants is of high standard and over 90 percent of them benefit from own water taps. But proper sewage disposal which is a basic necessity for a modern city is not satisfactory.
Due to the lack of a collection-treatment system other methods are implied, including the use of package plants and small treatment works, which usually suffer from poor performance and are open to objections.

SEWAGE DISPOSAL SYSTEM

The traditional Iranian house has two shallow wells for sewage disposal. Each well, constructed near the main building is usually 1-to 2 meter wide and 10 to 15 meter deep , leading to a larger space of 20 to 50 cubic meters. One well is used for stronger lavatory wastes while the other receives wash waters and week kitchen's effluents. The well acts as a system where water passes through underground soil and solids undergo anaerobic digestion, thus the sewage is disposed of with minimum effort. For areas where soil is of sandy nature and the quality and quantity of wastewater is not objectionable , little attention is required for satisfactory operation of this system. But in the case of industrial wastes and where water percolation is slow due to the nature of the soil wells do not operate satifactory and frequent discharge and emptying is necessary.

During the past two decades large blocks of apartments and high concentrated dewellings has dominated Tehran and the replacement of wells with package treatment plants and small sewage works has become inevitable.
Large communities have the required land and space so prefer to benefit from small but conventional treatment plants. Smaller areas small industries, hospitals and hotels go for prefabricated package plants. These plants consist of different types, from basic septic tanks to full activated sludge systems, but it seems that the latter type is growing in demand due to higher standards of effluents required by health authorities. Activated sludge package plants are easy to construct and at least on the paper are capable of producing effluents of very high standards. The owner of the package plant is often told that he could use the effluent of the plant to water the green area and the garden. But unfortunately this is not so in practice as the performance of these plants are very much a matter of good maintenance, proper design, and skilled operation. The present study looked into the performance of three package plants and a small conventional works. It is hoped that the findings of this study will help to pinpoint the difficulties and to make suggestions for improvement.

SCOPE OF THE STUDY

Three package plants of different sizes, marked A, B.and C investigated in this study were those belonging to a building complex a large hotel and a manufacturing factory without any industrial waste. The plants were receiving 20, 50 and 80 cubic meter per day respectively (design figures). Plant D which served a community of 500 flats, was a conventional small plant. All plants A,B,C and D were activated sludge type systems designed on extended aeration principles.
Frequent samples were taken from inlet and outlet of the plants as well as samples from the aeration tanks. The time of the sampling was mostly during the spring time were the climate and the ambient temperature was favourable. Samples were analysed in BBRC Sharif

University laboratories according to standard methods of analyses.

RESULTS

Table 1 shows the information which was available on these plants. Plants A, B and C were pre-fabricated from metal sheets, and plant D was a typical concrete structure. The effluent of all plants although expected to be used for watering the garden, was discharged to subsoil infiltration, and percolation.

Table 1

Plant	Type	Design cap. m^3/d	Aver. flow	Aeration tank m^3
A	Diff. Aer.	20	24	20
B	Diff. Aer.	50	60	50
C	Mech. Aer.	80	85	80
D	Mech. Aer.	400	420	380

Summary of the laboratory results of the samples taken at random intervals are shown in table 2. Each figure is the average result of at least six acceptable samples. Samples taken at the times of system breakdowns or other irregular functioning were considered unqualified and not used in the study.
As it can be seen from table 2, the performance of the three plants A, B and C are poor but that of plant D is comparatively better.
Plants A and B relied on diffused aeration system for provision of oxygen to the aerated tank. Return sludge was also carried out by air lift technique. Plants C and D were using surface aeration and sludge return was obtained by sludge centrifugal pumps. There was little to choose from the diffused air or mechanical surface aeration systems , bur more frequent blockage and breakdowns were recorded for the plants using diffused air mechanisms.
The centrifugal sludge pump responsible for transfering the sludge to aeration tank or to sludge silo often proved to be unreliable. These are noted by satisfactory levels of DO in aeration tanks and low concentration of mixed liquor suspended solids which represent the viable bacteria. Problems of sludge bulking were frequently observed in the first three plants, and excessive foaming was another matter of concern.
Plant D which was attended regularly by a technition was more promising. It was difficult to state that better design or better operation is responsible for more reasonable performance but both factors are considered equally important.

Table 2

Plants	A	B	C	D
	Influent			
pH	7.2	7.1	7.2	6.9
SS	260	235	210	180
Tot.Solids	950	920	850	840
BOD_5	275	290	220	195
COD	420	410	390	380
Tot.N	36	38	32	40
Tot.P	50	55	58	43
DO	4.5	4.0	5.1	2.8
	Aeration Tank			
pH	7.5	7.0	6.8	6.9
MLVSS	600	750	690	1050
MLSS	680	850	760	1340
DO	1.5	0.5	3.0	2.5
	Effluent			
pH	7.5	7.1	7.0	6.9
SS	80	60	120	45
BOD_5	120	135	115	35
COD	270	290	165	96
Tot.N	30	30	24	23
Tot.P	41	42	41	40

All figures except pH are in mg/l .

Low rates of BOD and COD removal observed , particularly in the first three plants could be as a result of high loading, food to microorganism ratios. F/M of the four plants were 0.55, 0.46, 0.34 and 0.21 day^{-1} which is high for extended aeration operation showing organic overloading is occuring. However the main reason behind this characteristic is low levels of MLVSS and the incapability of the plants to maintain a high mixed liquor volatile suspended solids. Factors such as sludge bulking , hydraulic overloading and flow surges causing sludge washout and harmful chemicals in the raw sewage are major contributors to a low level of MLVSS found in the aeration tank.
Comparing the performance of the four plants plant D was more stable and producing better results, reducing over 80 percent of the organic load shown by BOD_5 results. None of the plants affected the concentration of nitrogen or phosphates as required by modern standards and indeed all four failed to reach Iranian standards for treated sewage disposal.
The disposal of excess sludge which was expected to be a matter of importance was not observed here due to lack of sludge accumulation. But it was understood that sludge

disposal is usually one of the difficulties facing the operators of the package plants. Overall comparison of the four plants studied indicated that small conventional treatment plants could be better operated and could produce effluents of higher quality. In terms of capital investment too, one small concrete plant is more advantageous than several prefabricated package plants doing the same job. But the land requirement and disposal of the treated sewage is a factor to be considered in already developed areas of the city.

The reasons behind the poor performance of the package plants studied are classified in at least three sections:
a- Technical aspects
b- Operation and maintenance
c- Design considerations

TECHNICAL ASPECTS

Small activated sludge plants, particularly of the package type are often subject to technical difficulties, some of which are listed here:

-Variations in the strength and the flow of sewage is often a characteristic of package plants. There is a misguided belief among some that a package plant can somehow mysteriously cope with such extreme variations in loading, where a conventional biological sewage plant can not. This is not so and shock loads cause problems such as washouts and overloadings.

-Flow of toxins and chemicals impose shocks to microorganisms in the aeration tanks. Use of chemicals such as bleaching agents and strong detergents is quite common in modern life and due to small flow of sewage, they inflict a strong influence on the activity of the microbial cultures. Sludge bulking, low MLVSS are often the result of unhealthy environment of the aeration tank.

-The number, activity and variety of bacterial species is a point often neglected. The climatic and geographical environments are bound to have severe effects on the growth, transfer and even the maintenance of the microbial life. The sources of microorganisms for biological wastewater treatment are mainly the soil, the air and the stream water, and without a large enough variety of microorganisms it would be extremely difficult to maintain an adequately stable ecosystem in a purification plant. No data was available in the number of bacterial count of the units investigated , but a previous study had shown that there are only 4-6 genera present in such package plants where viable bacteria were found to be in the order of $1.5\text{-}6 \times 10^7$ per ml of mixed liquor in the aeration tank. These figures indicate that the number of genera and bacterial count is low by all standards.

-Plant loading, particularly BOD/MLVSS is another parameter which is difficult to control in small units. Although the design specifies loadings well within the acceptable range but most small plants cannot reach their expected values.

OPERATION & MAINTENANCE

Activated sludge package plants which are often of extended aeration type, are sensitive to oxygen level and concentration of mixed liquor suspended solids. Routin periodical quality control of the effluent must be carried out by determination of : settleable solids, pH, COD, suspended solids and other parameters which could control the biological balance in the system. Other controls which must be carried out regularly include:

-Daily removal of gross solids to prevent the sewage from backing up.

-Daily removal of grit which if neglected may lead to closure of the plant when this enters openings and block valves and pumps.

-Regular maintenance and lubrication of all pumps ,blowers and valves and indeed all moving parts is essential.

-Removal of excess sludge, or digested sludge to keep the site clean.

-Renewal of chlorine solution and other chemicals if necessary.

-Checking the electrical switches and circuits.

-It is invaluable to keep a plant record card and register the maintenance scheduals of the plant. Unfortunately this aspect of the operation is almost always neglected by plant owners in developing countries.

-Painting will help to protect the bare metal surfaces from corrosion. It also makes a presentable appearance of the unit. It is therefore essential to paint all metal parts at least once every two years.

DESIGN CONSIDERATIONS

The design of small sewage works including package plants must provide for and take into account a number of parameters such as:

-Simplicity of operation requiring minimum maintenance.

-Considerations for low impact on local amenity including smell and fly nuisanse , provisions for hygienic disposal of sludge by tanker for which loading facilities must be available.

-Considerations for construction and maintenance at reasonable cost, including fast repairs and minimum shutdowns.

-Site considerations including a safe working place adequately fenced.

-Provisions to take into account large variations in flow, the smaller the number of community served the greater the variation will be.

-Considerations for proper disposal of treated effluent, including the study of underground water tables to prevent the pollution of water. It is imperative that in many communities drinking water is drawn from wells near the site of treatment works.

-Other factors which must be considered include the availability of power supply , skilled manpower, particulars of effluent requirement and other parameters which could be important for an owner or operator of package plants or small treatment works.

CONCLUSIONS

Having completed all the preliminary investigations, the first step for a designer is process selection. There are a number of different types of package plants, requiring a wide range of capital and operating costs. The most frequently used treatment options found in Tehran are septic tanks and activated sludge units. Septic tanks do not produce effluents to meet the current standards so the choice is often limited to activated sludge package plants. However the present study indicated that activated sludge package plants could be as inadequate as septic tanks. On the other hand small conventional type of plants usually benefit from better attendance and could thus operate in a more satisfactory manner. Unfortunately their application is limited due to higher costs and land demand.

Increasing needs for better sanitation in Tehran (indeed most cities in developing countries) indicate that the number of small plants, conventional or package, will grow in future. But it is also expected that more stringent regulations of effluent discharges will also be applied. The designers and engineers are therefore faced with a very interesting and challanging situation to provide basic engineering for pollution control. The rewards could be high in terms of better sanitation for millions of people and infact in terms of economical values.

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Economics of sewerage schemes

J N Ambikar

1. INTRODUCTION

Sewerage scheme is one of the costliest public utilities generally planned as non-revenue scheme by the State. It is therefore of paramount importance for developing countries like India to attempt cost optimisation for implementing sewerage schemes. An attempt is made to highlight some aspects which work out to savings in cost and time - if not both - during all the three phases of the project namely (1) Designing & planning, (ii) Construction and (iii) Operation and maintenance. Policies and planning parameters influencing the labour deployment, time & ease of operations & thus ultimately having impact on overall economics of the scheme have also been briefly discussed.

2. DESIGN OF SEWERS

2.1 The rigid RCC pipes are encased with concrete for structurally safe installation in accordance with the recommendations (Ref.1). The cost of encasement with concrete is quite high while time taken for installation of encased sewer is quite considerable. At times cost of encasement is higher than pipe cost itself!!

2.2 However a close look towards analysis (Ref.2) of structural loads and relevant soil mechanics shall reveal that if arching action of the soil is considered the relevant co-efficient for vertical trench load becomes reduction co-efficient rather than concentration co-efficient resulting in lesser load over the pipe. Due to arch action the pipe is subjected to substantial lateral pressure and appreciable reduction in bending moments (Ref.3). It needs no explanation that the arching action is more effective as the height of cover increases and more conservative if effect of submergence is taken into account; while both these characteristics are predominantly present for normal urban sewer installations.

2.3 For normal sewer installations the impact factors of 1.3 to 1.5 used for computation of superimposed loads appear unreasonable obviously because impact factor reduces to unity at depths of 2.5 to 3 metres while sewers are normally installed at these or higher depths.

2.4 In view of above considerations, assumption of high pipe loads and low bedding factors prevalent in design procedure appear unnecessarily conservative at high cost. It is therefore felt that rational approach to structural design with due and justified consideration to above points shall result in adopting appropriate class of pipe with or without concrete encasement balanced with costs, man-days for installation, and adequate structural stability and still giving substantial savings in overall installation cost of sewer.

3. INSTALLATION OF SEWERS:

3.1 Installation of sewers at depth of 4 to 6 metres which involves timber shoring, pumping and bailing out of water contributes to high cost, longer time and working against environmental considerations.

Secondly the skilled workers required for laying-jointing of sewers and construction of manholes remain idle for certain period as the time taken for these operations is shorter than for completing excavations to desired profiles. Hence if owner-departments made capital investments in steel sheet piles, excavators & other related construction machinery and recover the cost in the period as longer as possible - which will be function of planned cyclic order of cities to be provided sewerage facility in a particular State - by hiring the same to construction contractors; the result would be savings in cost as well as time. This would also result in minimising use of timber to substantial extent & thus help in environmental protection - a gain in disguise! The construction contractor should be able to plan the execution so as to minimise the idle labour and open the sites which should be function of unbroken cyclic deployment of all the trades. This can be best achieved by a quantity surveyor who can develop histograms and charts of resources levelling for project manager.

3.2 Installation of sewer when desired as replacement of existing sewer coupled with increase in capacity of sewer, can be best achieved by newly developed sewer pipe insertion system developed in Britain claimed to achieve substantial reduction in disruption of civic life and major savings in excavation costs (Ref.4).

4. CONSTRUCTION OF MANHOLES:

4.1 Manholes are being constructed with bricks and concrete cost of which is spiralling high. If pre-cast RCC rings with interlocking projections are manufactured on industrial basis the construction of manholes shall be quicker with improved quality & reduced costs.

4.2 It is not necessary to provide cast iron steps for each and every manhole; as operation of going into the manhole is not advisable from safety point of view while sewer cleaning rods can be operated without getting into the manhole. A portable ladder which can be put to use when absolutely needed - frequency quite low in view of above considerations - will work towards savings in cost and ease of operation & maintenance.

4.3 Recent developments of using fibre-reinforced concrete manhole cover and frames which are 50% cheaper than conventional cast iron frames & covers with identical duties also imparts substantial cost reduction for manholes with added advantages pilferage proof longer lasting products reducing frequency of replacements as compared to cast iron products.

5. CONSTRUCTION OF SEWAGE PUMPING STATIONS:

5.1 Normally a square or rectangular shaped basement with dry pit non-clog centrifugal pumps is adopted for sewage pumping station. Instead a circular shaped pumping station will result in economic structural design, speedier and safer construction by well sinking method and non-risky construction w.r.t. adjoining structures whose structural safety is otherwise at stake. The space requirement for construction activity is also less which is of immense importance in conjusted busy commercial city area.

5.2 Vertically mounted submersible pumps will further give reduction in size of pumping station but is not gladly accepted due to de-alignment problems of vertical shaft at a troublesome frequency.

5.3 In result it can therefore be concluded that circular pumping station with dry pit pumps may sometimes be found expensive but is economic if safety and speed of

construction & construction risks are also evaluated with due weightage.

6. CONSIDERATIONS TO SEWAGE TREATMENT AND EFFLUENT DISPOSAL

6.1 The conventional sewage treatment facilities are designed to meet standards as per IS 4764 which are superfine characteristics. To meet these requirements;if anaerobic treatment facilities are designed they are found high in capital cost & requiring adequate land, cost of which is spiralling with time in urban areas; while if aerobic treatment facilities are designed they are found to require high recurring cost due to energy requirement and demand for skilled personnels for even optimum efficiency of plant. These processes of either kind involve large structures needing again costly foundation treatments.

6.2 Recent studies, have established that fluid bed submerged media anaerobic reactors (SMAR) can be used to treat domestic wastewaters to achieve secondary effluent standards at high organic volumetric loadings and low hydraulic detention periods. The major advantage of treatment with SMAR is high savings on energy cost as compared to extended aeration systems or aerated lagoons. Another major advantage of this technology is savings on land requirement and higher energy recovery in the form of bio-gas (Ref.5).

6.3 It has been reported (Ref.6) that conventional method of designing settling tanks by fixing an overflow rate corresponding to the smallest particle size to be removed; yields uneconomical design and hence the design of settling tank with respective desired overall removal for given particle size distribution and density characters should be adopted. This approach will give economical design of settling tank & minimise waste of capacity.

6.4 As regards construction of the plant, apt utilisation of stability of slopes for housing the aerated lagoons, aeration basins with trapezoidal shapes & the structure of like sizes & shapes should work towards savings in cost. Adoption of floating type of aerators minimising need for approach or operating walkways of permanent nature, also work out to savings in cost however small.

6.5 So far as effluent disposal is concerned rational approach must be given to the source of final disposal. If a saline stream, or ocean is available it would be enough if tolerance limits for inland surface waters subject to pollution (Ref.7) are satisfied, obviously, because it does not violate directive principles laid down by the authority (Ref.8) namely IS 4764; for, water from these kind of sources are not used for drinking, bathing, or industrial purposes. Hence it is felt that treatment facilities producing highly polished effluent at high cost should be discouraged & process design should be limited to optimum standards in accordance with requirements of source of disposal.

6.6 In view of above considerations it can be concluded that rational approach to design of treatment facilities with due and justified thought to latest technology, optimum effluent standards those are really needed and to the site features; all taken cumulatively will result in substantial reduction in cost capital as well as recurring.

7. PLANNING OF STANDARDISATION OF ROAD SECTIONS, SPECIFICATIONS ETC.

7.1 It is a hard fact that the exhaustive planning regulations & policy guidelines (Ref.9) for accommodating underground

utility services seldom find field application due to practical field constraints & many times marred by unplanned development of city. Yet, it is felt, that cost optimisation & efficient maintenance of sewerage system is possible if precast concrete panels with high frequency of bituminous expansion joints are adopted for central road strip of say 2.5M width for two lane road & end road strips of similar dimensions for four lane road while sewers & manholes are housed in these strips.

7.2 Above considerations will help in installation and maintenance of sewerage system without disruption to traffic & other services and acceptable aesthetics for such operations. Adoption of concrete panels for these strips shall yield savings & ease in operative labours as well as arrest transmission of caving effects to carriage ways due to otherwise excessive haphazard excavations for installation & maintenance of sewers. If frequency of operations is low as in the case of large diameter (more than 400mm dia) sewers these road strips can be converted into road dividers, traffic islands, to derive advantage of added aesthetic & beautiful environments.

8. CONCLUSION

By way of proper co-ordination between technocrats, economists and planners a substantial cost optimisation and overall economics of sewerage scheme can be effected to which the authorities responsible for framing the policies and growth strategies of developing nations should give serious thought and direct the respective talents through suitable instruments of administration.

9. ACKNOWLEDGEMENTS:

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16th WEDC Conference

Infrastructure for low-income communities

Hyderabad, India 1990

Sanitation a way of life

Ramahari Mohanty

1. INTRODUCTION

Sanitation is generally understood as providing hardware components for use. It may be partially true. But the other aspects of sanitation, which involves the entire life and the thinking process of man is rather not given importance. The target oriented programmes followed in India and other third world countries to reach more people in shortest possible time may have some logic, but in a hurry to do so an important point is missed. That is the change of mind of the people as well of the functionaries. Without that the change of life style from insanitation to sanitation can not be expected though there may be sanitary facilities. It was thought before launching of schemes that people will automatically change their way of life towards better sanitation once some facilities are provided to them free of cost. This did not happen automatically in all cases. The reasons for that are many and varying.

The interesting aspect is that some of the functionaries at Government and non-govt. levels working for the programmes have also not been properly and adequately motivated though efforts have been made in that direction.

The success of low cost sanitation projects depends on various factors. Both favourable and unfavourable factors awaits us in the field, which are integral part of a society and system in which we operate. It depends on us how best or how worst we function so as to lead us to success or failure. But one thing is sure that these factors are to to be identified and analysed before and during the operation of any project. An effort has been made in this article to reflect some of the important experiences gained in the field in last four years in Orissa State.

2. OBSTACLES ON THE WAY

There are various factors which are responsible for putting obstacles on the way of smooth implementation of sanitation schemes. A few are discussed below basing on actual field experiences.

2.1 Unfavourable human factor

One of the important factors which stands on the way of smooth implementation of sanitation programmes is unfavourable human factor. The reactions to any new ideas and programmes are different, sometimes diametrically opposite, in case of different people who are guided by their own life philosophy and the situation in which they live.

The level of perception may also vary from person to person basing on educational and social background, which affects the functioning of any scheme. The unfavourable human factor is more prominent in societies having low literacy rate and backwardness where people are not generally interested for improvement and change.

2.2 Priority factor

The items which have top priority with authority may not have same priority with people. It may also vary from person to person and area to area. So any scheme launched with top priority by the authority may not find favour with people who may have other problem in their priority list and the scheme may suffer. For example, a water supply or school may be more essential and wanted in an area than sanitation facilities.

2.3 Socio-cultural-religious factors

Insanitation leads to diseases, bacterias and viruses are causes of that. This is a scientifically proved fact for many of us, through our education and training, who are functionaries also. It might have been heard or read by a section of people also through various sources. It is a matter of conviction on our part and we plan and launch our schemes accordingly which may not be same with all people. Some people believe that the diseases and sufferings are due to their bad actions in previous life, which they are facing now. It has nothing to do with bacterias or viruses.

Some people think night soil is inauspicious thing, which should be kept far away from places of residence so they oppose latrine

and favour open open defecation. Other superstitions, like male members not using same latrines which are used by grown up girls, are bottleneck in sanitation project in some areas. The illiteracy is one of the most important factors which stands on the way of change of mind.

2.4 Sub-standard works

This is one of the most important factors which is primarily responsible for failure of some sanitation projects. A sub-standard work not only denies the required services to the people to whom provided, but also repulses other people of the area and nearby areas for a considerable period of time, who might have been motivated or who might be very responsive to get some sanitation services. This negative action of low quality work spoils other such future projects in the area and around. Moreover sub-standard works may lead to pollution of nearby water sources thereby spreading diseases, if the sanitation facilities provided are some how used and subsequently become defective. A standard work may act like nucleus and have radiation effect attracting many towards the programme.

2.5 Elitist arrogance

Some functionaries in various levels may not create required confidence in people and may not have good rapport with them inspite of their hard work and best efforts, which affects the functioning of the project badly. Knowingly or unknowingly their way of life, food, talk, dress and actions etc., may be responsible for the sorry state of affairs inspite of the fact that they are good workers. This may be termed as elitist arrogance, which affects the human psychology slowly and works silently.

3. OTHER SIDE OF THE STORY

Though we may have many unfavourable factors standing on the way of sanitation programme, there is bright sides of the case which has helped in launching and running the schemes successfully in some areas.

3.1 Human factor - favourable

Contrary to the general believe that illiterate and backward people have little tendency for sanitation, it is noticed that some people of all sections of society have shown inclination for sanitation facilities. It is not the social, economic or educational status which guides their desire. It is their internal urge which has acted. Instances are not rare where rich and educated people have not shown inclination for sanitary facilities where as poor and uneducated have spontaneously wanted to have it and have got it. This factor has helped a lot in pushing the schemes through in some project areas.

3.2 Physical compulsion

A desire to get sanitary facilities has also been guided by another factor - physical compulsion. In very thickly populated big villages where open spaces are not available near residences and one has to walk a considerable distance to go to the end of the village for open defecation, the desire and demand for latrine is very strong and high and schemes have become highly successful in those areas provided the quality of work is up to standard also.

3.3 Motivation and education

As 100 per cent coverage is not feasible under rural sanitation, motivation may not be necessary if the villages with ideal conditions having physical compulsions to opt for sanitary latrines, are selected and the beneficiaries who have internal urge for sanitation are picked up. This has happened in some cases. It may not be possible always with area-specific projects. Moreover it may take years to pick up such areas after detailed survey. So with specific areas and villages in view motivation is a inherent part of exercise in the programme to enlighten and convert the fence sitters. With dedicated workers at disposal and proper materials at hand, motivation and education has proved to be an effective tool to overcome the mental hesitation and other short comings of the beneficiaries at large.

3.4 Training and orientation

The art of motivation and education depends on the skill and soundness of knowledge of the functionaries and workers about the programme. A good hard working officer may not necessarily be proficient in a particular programme unless he or she is trained and oriented properly and adequately. The technical personnels also require detailed training about the works. A number of sanitation projects has been completed successfully due to proper training of functionaries. Committed and dedicated trained functionaries with missionary zeal have done miracles in some projects. Some of the projects are not up to expectation due to untrained and unwilling functionaries at the helm of affairs. Moreover methodologies adopted in

the training, the standard and personality of trainers and type and quality of materials used in the training has a great bearing on the qualitative aspects of training which decides the fate of the projects.

3.5 Communication - an essential tool

Communication gap and faulty communication leads to confusion and convey unclear, often wrong, pictures and signals about the work to the people leading to distortion of whole affair and ultimately landing at trouble. Sound communication strategy selecting appropriate medias and materials of communication has paid rich dividends in some projects. But in this field some more are left to be done always and some other persons may have to say the last word; as this is now a highly innovative area of action added by modern science and high-tech communication techniques.

3.6 Monitoring and evaluation

Without monitoring no project is considered to be running in the track properly. Though some think monitoring as counting and summing up numbers of works and funds involved. Actually monitoring is the check and balances in the system, provided it is applied timely and sufficiently. No project is sound in itself with action plan only unless it passes through the hazardous path of implementation, when all shortcomings in the project comes to surface and obstacles are faced. Here the role of monitoring comes which set right the wrong and removes the bottlenecks making alterations and additions, if necessary, in the original scheme. Experience shows closely and properly monitored programmes have come with flying colours where as poorly monitored and neglected one has suffered like a sick child never coming up the ground. Projects monitored from various levels such as from block, district and State levels separately and independently have shown good results and projects not getting that opportunity have their share of misfortune. (Example - Sanitation Cells at various levels)

3.7 Involvement of beneficiaries

Involvement of the beneficiaries in the programme including construction process and their acceptance of the project prior to launching has helped a lot in successful implementation of the projects and subsequent maintenance of the services. Whereas implementing projects as a Government scheme only without or with little involvement of them has landed the project in trouble. Projects having some beneficiary contribution (money, materials or labour) are 100 per cent success, where as projects with full charity are not so.

3.8 Associating the voluntary organisations

It is no doubt a Voluntary Organisation acts as a catalyst between the authorities and the beneficiaries. We have active support of voluntary organisations, woman organisation and individual volunteers (Man and Woman) in many projects. It would not have been possible to achieve good results without their help. Unfortunately the functionaries in some projects have acted differently and never thought to or could not manage to involve such organisations and ultimately have paid the prices.

4. CONCLUSION

Like other infrastructures for low income communities, sanitation facilities are also low cost infrastructure to bring a change from insanitation to sanitation to provide better health and ultimately to provide better life to the needy people. Sanitation facilities may be termed as a vehicle to move in the desired direction, but like other actual vehicles of movement it also require driver, fuel and lubricant and proper road with less obstacle and resistance. The functionary in Government and non-Government levels connected with sanitation projects are drivers of this vehicle who, like expert drivers for safe and smooth journey are also to be well conversant and trained in the line. Similarly the factors which contribute for successful implementation of schemes (such as physical compulsion, committed beneficiaries, motivation, education, training, orientation, monitoring standard work etc.) may be named as fuels, lubricants and better maintenance to run the vehicle. Also the unfavourable factors on the way (such as illiteracy, superstition, socio-cultural factors, sub-standard work, improper selection of villages and beneficiaries etc.) which retards the speed of work may be termed as bad road and obstacles on the way. So for smooth launching and running of sanitation schemes, overcoming the difficulties, the functionaries at all levels as well as their conducting of various programmes are to be at the best. Otherwise this programme may remain standstill or may not run smoothly without momentum like a vehicle without proper driver, fuel and maintenance.

This may be applicable to some extent to other low-cost schemes any where with similar circumstances and conditions. Provision of fund and thereby the hardware does not solve the problem automatically. Other timely and appropriate follow up measures; like proper survey and investigation before preparing schemes, ascertaining aspiration and priorities of people, views and acceptance of people about scheme and facilities to be provided, adequate orientation and training of functionaries, arrangement for bridging communication gaps by various means and materials, involvement of voluntary organisations, woman organisations and individual volunteers (both sex), etc. are must for any scheme to succeed, so also sanitation schemes.

Sanitation does not mean using a latrine or drinking safe water only. It is the total way of life with regards to entire physical and socio-cultural environment reflecting the overall fine culture of man or society or nation. It cannot be forced from within. Of course our programmes and efforts can help to guide, enlighten, inform and educate people with help of modern facilities which may not be within their concept and reach. It may be a slow long journey. We are to wait patiently if we want result as it requires change of mind and habit, not only possessing sanitary facilities only. Sanitation a way of life seems to be easy task, but actually it is one of the difficult tasks for any functionary, specially in third world countries with adverse socio-economic-cultural conditions.

Two statements are given below:

I. SANITATION PROGRAMME

FUNDS AND HARDWARES (AS VEHICLE)

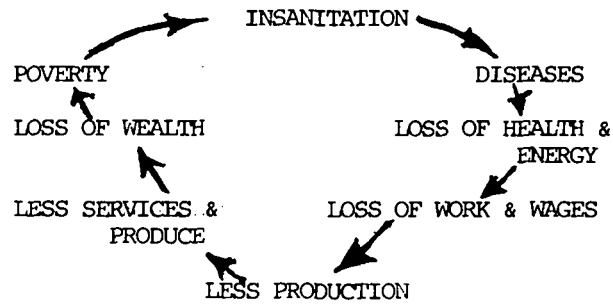
FACTORS FOR SMOOTH RUNNING (AS FUEL AND LUBRICANT) - 'A'

FUNCTIONARY AND WORKERS (AS DRIVER)

OBSTACLES ON THE WAY (AS ROAD TO RIDE) - 'B'

HUMAN FACTOR (FAVOURABLE)	
INVOLVEMENT OF PEOPLE	
PHYSICAL COMPULSION	
ECONOMIC FACTOR	A
MOTIVATION	
TRAINING	
EDUCATION	
ORIENTATION	
COMMUNICATION (EFFECTIVE)	
STANDARD WORK	A
MONITORING	
EVALUATION	
VOLUNTARY ORGANISATIONS	
HUMAN FACTOR (UNFAVOURABLE)	
SUPERSTITION	
ILLITERACY	
WRONG PRIORITY	
SOCIO-CULTURAL FACTOR (ADVERSE)	
ECONOMIC FACTOR	
SUBSTANDARD WORK	
COMMUNICATION GAP	B
UNWILLING FUNCTIONARY	
LACK OF SUPERVISION	
UNTRAINED FUNCTIONARY	
BENEFICIARY NOT TAKEN INTO CONFIDENCE	
SERVICES GIVEN AS CHARITY.	

II. INSANITATION & POVERTY CYCLE



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16th WEDC Conference

Infrastructure for low-income communities

Hyderabad, India 1990

Awareness building for community participation

Mrs Aloka Mitra

Introduction

This paper attempts to record a few field experiences of building awareness among rural communities of new innovations and improvements in rural water supply and environmental sanitation and to share briefly, the approaches for implementation.

It has particular reference to experience of awareness building in connection with

- the UNICEF/UNDP/Govt. of India sponsored Feasibility Study in low cost rural sanitation in West Bengal.
- Promotion of sanitation through Integrated Child Development Services (ICDS) Programmes
- Training programmes for conducting sanitation campaigns in Madhya Pradesh.
- Programmes for awareness camps in West Bengal villages covered by the Technology Mission on Drinking Water Supply in West Bengal.
- Promotion of sanitation in predominently Schedule Caste and Schedule Tribe villages, aided by CAPART.

The above awareness building linked with hardware activities were undertaken, through the Women's Co-ordinating Council (WCC), a voluntary agency constituted of 105 women's voluntary organisations in West Bengal as a part of promoting integrated projects which improve the quality of life for women, children and the community.

Background

Many development projects have very limited success due to the failure to involve communities who are passive recipients, resistant and even critical of programmes and projects undertaken for them.

This is particularly evident in water, sanitation, housing, smokeless chulhas and other technology development programme which intimately affects the communities daily life and habits.

A well designed strategy to create awareness and bring about active community participation is a basic prerequisite for any development programme. This includes a communication support or information, education, motivation (IEC) to **provide** the necessary **knowledge base for community involvement** and participation in planing decision making, implementation, proper use and maintenance of the utilities provided.

A holistic approach to water and sanitation often involves retaining good habits and practices but changing those that are harmful in order to derive the maximum benefit, improve the health status and the quality of life in the entire village.

Hence **awareness building** programmes must be designed **for the entire village community** - men, women and children through various approaches.

Participation of women and men

It is essential that women should participate with men at household and community levels in making decisions between technology options, design, location, maintenance of water supply and sanitation facilities i.e. handpump, wells, tanks, sanitary latrines, smokeless chulhas, bathing enclosures, garbage pits etc. since they are the primary users of these facilities.

It is important to note that promotion of women's participation is not a separate effort, parallel to men's participation. Men and women need to have an integral vision of their responsibility in water and sanitation.

However, greater effort and focus must be given to awareness of women because generally development plans and programmes, are planned and implemented without the involvement of of women.

Teams of **women trainers and communicators** who are experienced at working and motivating rural communities are necessary for involving women and men.

After conducting **surveys** and **collecting data on the habits and practices of** different **communities** WCC developed **visual aids for education** which are attractive to the village community and convey simple relevant messages that are easy to understand.

Clay models depict typical insanitary village situations, routes of diseases transmission, causes of water pollution, simple technology and self help for improving existing situations such as soak pits, garbage pits, drainage channels, platforms for handpumps, hore hole and sanitary latrines. Posters, slides, flip charts, flash cards, puppets, plays etc. are all used for awareness programmes as required.

A FEW APPROACHES AND EXPERIENCES IN AWARENESS BUILDING DURING WATER AND SANITATION PROGRAMMES -

- In 1985-86 Orientation/Training was conducted by WCC in West Bengal at State, District,

Block and Village level for all government and non-government functionaries connected with the GOI/UNICEF/UNDP Feasibility Study in Low Cost Rural Sanitation covering 350 villages in 5 districts in 9 blocks. Public Health Engineering Department (PHED), West Bengal was the implementing agency.

Orientation/Training at State, District, Block and Village level.

At District and Block level 643 men and 191 women participated in the two-day orientation training programmes. Participants were from the departments of Rural Developments, PHED, School Welfare, Education, Health Panchayet and Mass Media, Youth Club and Mahila Samity members, teachers, ICDS personnel, village doctors.

Training village level motivators is an important step in awareness building and creating a sustainable infrastructue for software and community participation.

Three motivators were trained from each village and an appropriate course content was developed for them. In village provided with latrines in fifty selected homes the recipients were informed motivated through household visits, group discussions and village camps.

Training motivators for awareness campaign

Despire several constraints, a spot check/survey done after one year showed that villages where awareness building was **well co-ordinated with construction activity** (i.e. began before and continued during and after) there was a high degree of community awareness and participation.

The beneficiaries were selected from the poorest families yet in villages visited by the team at regular intervals or where the motivators were active

- the superstructure have been constructed with locally available material according to affordability levels. Women have trained children and the aged to use latrines and are keeping them clean by following the information relayed during awareness camps and household visits.
- Several good health and hygiene practices have been adopted and a number of latrines have adjoining bathing enclosures. A few of families who were not given latrines made bore holes and saved up to make dug well latrines within two years. Dung and gargabe pits were made and handpump platforms repaired.

Tremendous demand for latrines from families not covered under the programme turned to disappointment because there was no folow-up of the programme.

Latrines in institutions for awareness

Latrines in primary school, youth club, mahila samity, mosque, temple, markets and so on were built to reach and motivate large numbers, but without a well designed strategy for promotion they did not have the intended impact.

- **The Integrated Child Development Services (ICDS) programmes** currently implemented in a large number of blocks in India is an important channel for awareness building.

The Anganwadi Centre at village level is a focal point for various mother and child development services. Latrine units have been constructed by WCC in 125 villages at Anganwadi Centres spread over 5 Blocks. **The children at the centre can be trained to use** the latrines and inculcate good hygiene habits. Mothers can become familier with the technology and concept of household latrines, no-cost or low-cost sanitary improvements and adopt necessary change in hygiene practices.

Subsequent awareness programme through two-day camps were conducted for ICDS personnel, Block Level government functionaries of departments, Panchayets, teachers, health workers, and local NGOs. The parties became oriented on the concept of integrated water, health, hygiene and sanitation for raising the health status of children and the community, implementing such a programme how ICDS can link with other departments for promotional work and motivate the community through the ICDS channel.

It was observed that the participation and response from the community in these blocks was much greater than in the three others. Children at the centre were taught good hygiene habits and sanitation messages through action songs, poems and plays. Mothers were oriented during monthly meeting and home visits.

Children assist in making soak pit

There were requests for constructing household latrines from applicants willing to bear full costs there was no follow up of the programme.

Training Modules for Building Community Awareness

In collaboration with UNICEF, WCC and four leading training institutions have developed core training syllabi for five categories of personnel who can promote integrated water, health and sanitation programmes. The five categories of personnel found to be most relevant groups are trainers, primary school teachers, ICDS field staff village sanitation motivators and masons.

Motivators may be youth club and mahila mandal members, Panchayet members, village level workers and others willing to sustain programmes.

These modules are being used to strengthen IEC activities in support of integrated sanitation programmes.

The core syllabi highlights the key aspects of water and sanitation to be promoted. Relevant local situations, local culture and beliefs can be incorporated to complement the core content.

Visual aids have been extensively used as they have been found, from experience, to be very effective communication tools. The training of school teachers, ICDS staff and village motivators is usually conducted in the villages. Since electricity is not available in many villages the visuals are basically flip charts,models, flash cards and posters.

Household visit during training

The training modules have been used to conduct water, health, and sanitation awareness programmes covering all three ICDS blocks in Andaman Island in collaboration with the Government and UNICEF, 286 participants were Anganwadi workers, supervisors, health workers, Panchayet members and Block personnel.

ICDS modules have also been used in two districts of West Bengal and the community response has been quite encouraging.

One of the purpose of conducting awareness building programme is to orient/train existing channels and create informed and motivated human resource base at community level which can continue promotional activities with water, health and sanitation, inform and involve the community at every stage and form the link between development planners and the community.

Monitoring the effect of awareness building in terms observable behavioural change and other indicators of community participation is an important component in the training syllabi of the modules.

Awareness Building Camps linked with rural water supply and the Drinking Water Mission, Department of Rural Development sponsored by CAPART.

In collaboration with the district nodal agency, the department of the rural development and PHED, meetings and discussions held at District and Block Level created an awareness of the different approaches for awareness building among the government functionaries, Panchayets and representatives of various interest groups. They were sensitised to the need for community participation for maximum benefit in terms of proper use, maintenance, raising the health and hygiene standard, the role of women, men and children and so on.

The camps held in 70 villages in 10 blocks is of two day's duration. A general survey of the village situation, the habits and practices related to water and sanitation may be done through household visits, group discussions and observations. This survey and data collection is essential for an awareness programme which is relevant to the actual situation, problems, constraints etc. existant in the villageswhich affects women, men, children and the aged in different ways.

Awareness camps should be held at a time convenient for women participants. The venue must also be a central place in the village which is easily accessible.

Farmers working in their fields often requested a second camp in the evening which are held in the light of lanterns.

At camps women and men community volunteers/motivators are identified to continue awareness building through specific activities which the participants themselves suggested during group discussions and sessions on action plans.

There is no provision for incentives for motivators therefore metal badges of the Water Mission are pinned on motivators to give them recognition and encouragement.

The programme includes field visits with groups which walk through the village, note observable improvements and also instances of poor hygiene, water wastage, stagnant water, insanitary conditions around handpumps and wells

etc. They hold discussions around observe and discuss source, storage and use of water and hygiene habits.

Community building handpump platform

Household visits create and and awareness at family level, awareness of the village situation and the community participation necessary to bring about necessary changes on habits and practices and good use and maintenance of water sources.

- **Training of Trainers, Engineers, Sanitation Motivators, school teachers and ICDS personnel** held in one block in Madhya Pradesh was linked with a sanitation campaign which included the construction of household latrines. Measons training programme by an NGO developed local hardware in frastructure. The programme was organised by the modal government department with UNICEF support.

Motivators were youth club and mahila mandal members, Panchayet members, adult education teachers and other interested villagers with leadership potential. They are assigned specific observable activities which will be monitored monthly and involve the participation of each household, Panchayets, institutions such as schools, anganwadi centres along with government officials in charge of the hardware.

The human resource already exists in villages. Board based strategies for informing orienting, training and empowering the existant village infrastructure is necessary to enable the community to participate at all stages of development programmes. There was tremendous response from the community observed towards the end of the programme.

A few observations on awareness building

- Awareness building programmes within a community may begin at any time around general issues that concern their daily life. A variety of approaches may be used by catalysts who may be intermediaries who come from outside to assist in building a village level infrastructure for decision making and action linked with specific development programmes.

It should be undertake within a flexible time time frame which allows the community time to understand, accept, or even reject, make modifications, decide on their role and agree on the extent of their participation. However, the delivery mechanism must be prepared for an immediate response.

- Experienced women informants, facilitators or intermediaries should be involved from the planning stage to ensue women's participation in decision making and management at community level. They should be committed persons because awareness building is an ardous process but once achieved, even partially, it can be extremely rewarding for the development planners, implementors and the community.
- Correct information be conveyed through several channels adopting diverse local approaches but through organised integrated strategies which are broadly replicable.

Women communicators for community participation

16th WEDC Conference
Infrastructure for low-income communities
Hyderabad, India 1990

PLENARY SESSION 4
Water supply and sanitation programmes

Discussion on Papers

WATER SUPPLY AND SANITATION PROGRAMMES

Chairperson:
Dr S R Govindarajan

Co-chairperson:
Dr M E Ince
WEDC
Loughborough University of Technology

Papers presented:

G AKOSA, P BARKER & R W A FRANCEYS
Appraisal and evaluation - a new approach.

Dr P P MOWLI
Drumstick seed as a coagulant.

R K SIDDHI
Water supply and sanitation -planning for the nineties.

R A BOYDELL & W QUARRY
Integrated infrastructure development.

Ms P RAHMAN
Low cost sanitation programmes -Orangi.

Dr M BORGEI
Performance of small sewage works in Tehran.

J N AMBIKAR
Economics of sewerage schemes.

R MOHANTY
Sanitation a way of life.

Mrs A MITRA
Awareness building for community participation.

DISCUSSION

Dr P P MOWLI

1. Dr MAHAPATRA (UNICEF, New Delhi) noted that drumstick seed removes turbidity, but asked whether it also killed bacteria; commenting that bacteria in water can be harmful but that turbid waters are not necessarily unsafe to drink.

2. Dr MOWLI replied that drumstick seed powder is not a disinfectant, but that the removal of turbidity removes suspended particles and the majority of bacteria from a water.

3. Dr BORGHEI (Sharif University, Tehran) said that, in his opinion, the use of drumstick seed powder was inadvisable. He commented that the application of organic compounds to drinking water is not recommended in most parts of the world, and that the use of drumstick seeds as a coagulant at a dosage of 20 - 300 mg/l would cause pollution and contamination.

4. In reply, Dr MOWLI said that particulate matter associated with the drumstick seed powder is removed from the stock solution by filtration. Objections to the addition of organic matter would not apply if this suggested procedure for coagulation were followed.

5. Mr MUKHOPADHYAY (Water Supply Division, Calcutta Municipal Corporation) asked whether the author had any experience of using Moringa seed as a coagulant in place of alum for municipal water supply, whether an economical comparison had been made between Moringa seed and other coagulants, and whether a supply of the seed was available for large-scale use.

6. Dr MOWLI stated that tests to date had only been on a small-scale trial basis, and that the cost and availability of Moringa seed would depend on the extent to which it is used.

7. Mr McINTOSH (Asian Development Bank) asked whether the author was aware of a paper on the application of Moringa seed for use in water purification, published in the journal 'Waterlines' and written by by Dian Desa, an Indonesian NGO.

8. Dr MOWLI stated that he had not previously known of the paper mentioned.

9. Mr SMITH (WEDC, Loughborough University) noted that Figure 1 in the paper showed plain sedimentation test results for two water sources, but that the same Figure only showed one line for sedimentation using each coagulant. He asked which of the two waters was used for the coagulation tests.

10. In answer, Dr MOWLI stated that all of the waters were used in the tests for the removal of turbidity. The single line on the graph applied to both waters.

R K SIDDHI

11. Mr THAMPURAN (Superintending Engineer, Kerala Water Authority) drew attention to the fact that, in some countries and districts, detailed maps showing roads, contours and other features are either unavailable or not updated. This problem applies to Kerala, where master plans are being prepared for each district for the expected population in 2021. Technical surveys and basic social surveys have proved very useful in planning and designing water supply schemes. This system allows collection of data to be prepared in the office according to the 'demands' of the donor agencies. Mr THAMPURAN asked whether such a system could be adopted, and whether it is recommended.

12. Mr SIDDHI agreed that the comments about the need to prepare a master plan for each district were quite valid. He then added, however, that his paper described the purpose of the study as being to have a sector paper incorporating the sector status, strategies and future programmes in various packages grouped together according to the requirements of donors. These would then be studied in detail so that maps and reports could be prepared in collaboration with the respective donor.

R A BOYDELL & W QUARRY

13. Mr MOHANTY (State Sanitation Cell, Orissa) agreed that there was a need for those involved in water supply to change their minds about the consumption of water, especially for piped water supply schemes. He suggested that the conventionally adopted consumption figure of 40 lcd needs to be reduced.

14. In reply, Mr BOYDELL stated that, in his opinion, the criterion of 40 lcd needs to be reviewed. He believes that schemes should be designed after a review of actual consumption, and the potential for private connections and future expansion. This may entail studies of water demand and willingness to pay.

15. Mr MATHUR (UNICEF, New Delhi) commented that the paper generally gave a good analysis of the current situation, but past work has provided good lessons which are now being reflected in the GOI (Government of India) approach to the next plan period for the water and sanitation sector. In the water sector, the major issues reflected are: a. community management; and b. cost sharing. In sanitation the issues are: a. awareness building; b. clear-cut financial allocations for the IEC component; c. a demand based programme based on 'felt need'; and d. the promotion of sanitation not only as a latrine-construction activity, but as a package of activities including wastewater disposal, garbage disposal, personal hygiene.

16. Mr BOYDELL appreciated these comments as a welcome addition to the paper. He added that the GOI is trying to embody these concepts, through the sector approach papers in the 8th Five Year Plan. This indicates that the government is sensitive to the experiences of the Water Decade, and the need for institutional strengthening at local level during the dawn of decentralization.

17. Dr MAHAPATRA (UNICEF, New Delhi) commented on the highlights of the paper, namely: integration, community participation and decentralization. He suggested that these could happen if: a. they were made part of policy; b. they were made part of the system of implementation; or c. provision is made in decentralized systems for necessary resource allocations and power transfer, reflecting programme priorities. Mere lipservice to these concerns without translating them into policies, funds resources and power transfer will not improve matters.

18. Mr BOYDELL agreed that the GOI is indeed trying to embody the concepts of community participation and decentralization in the water and sanitation sector approach papers being developed for the 8th Five Year Plan. Mr BOYDELL and his colleagues look forward to reading them. These approach papers should form a basis from which policy and resource allocation practice can be modified.

19. Miss ZACHARIAH (Socio-Economic Unit, Kerala Water Authority) asked whether the authors' experiences had provided them with any indication of whether coverage with appropriate and planned sanitation alone could significantly ameliorate existing local health conditions. Her experiences from Kerala indicated that the construction of just over 1000 latrines, covering approximately 22% of the population of a village, had resulted in a reduction of water borne/water related diseases from 87% (in 1986) to below 2% (in 1989).

20. In replying to this, Mr BOYDELL stated that the measurement of the health impact of water supply and sanitation projects is extremely difficult. However, the development of new 'case control' study methodologies have apparently indicated a decrease in diarrhoeal diseases that can be attributed to water supply and sanitation interventions. He cited projects in Bangladesh and Lesotho as examples of this.

Ms P RAHMAN

21. Miss ZACHARIAH (Socio-Economic Unit, Kerala Water Authority) asked the same question that she had addressed to Mr BOYDELL, seeking evidence of whether coverage with appropriate and planned sanitation alone could significantly ameliorate existing local health conditions.

22. Ms RAHMAN agreed that provision of proper sanitation alone can reduce the incidences of diseases such as typhoid, scabies, malaria and dysentery. The Orangi project provided evidence of this, and statistics are published in reports of the Orangi project.

J N AMBIKAR

23. Mr THAMPURAN (Superintending Engineer, Kerala Water Authority) noted that stoneware pipes are usually used for small sewers of 150 to 200 mm diameter, and asked why the author preferred cement concrete pipes. He also suggested that High Density Polyethylene pipes, or Poly Vinyl Chloride pipes, could be used for low water use systems because they do not need special beddings, are cheap and have smooth internal surfaces.

24. Mr AMBIKAR replied that stoneware salt-glazed pipes are commonly used for sewers of from 150 to 300 (or even 400) mm diameter. He had no objection to their use, and had used them on projects himself. The plastic materials have good flow-carrying characteristics, but are easily damaged by members of the public. These materials are also flexible, so that they may easily be deflected from the desired gradient. Flexible pipes are therefore undesirable for gravity sewer lines. Cement concrete pipes need fewer joints than stoneware salt-glazed pipes and are therefore preferable because they reduce the amount of infiltration flows.

25. Mr NARAYAN (Consultant, Pune) asked whether a comparative study had been made of the costs of different materials and design techniques; and what the total costs per hectare were.

26. Mr AMBIKAR was grateful for this, and later, questions raised. He stated that a comparative cost analysis was required, but had not yet been attempted. As indicated in his paper, the present cost for conventional sewers to the project site was Rs 166470/- per hectare sewered.

27. Mr NARAYAN (Consultant, Pune) noted that the use of Reinforced cement concrete (RCC) rings had been suggested for provision of manholes in place of brickwork or in-situ concrete. He considered that this suggestion had four disadvantages: a. House connections would need to be made after the end of the scheme; b. RCC rings are not watertight, so could allow sewage to pollute the groundwater, and would permit infiltration; c. A reinforced cement concrete slab over the entire ring would be needed; and d. It would be difficult to make the RCC ring good after making a house connection.

28. Mr AMBIKAR said that, of these, the first and last objections would be alleviated by making all house connections (present and anticipated) during the project period. This would avoid any unnecessary double-digging, which causes inconvenience and irritation. He did not agree with the second objection; and suggested that a fibre reinforced concrete cover, having a 500 mm diameter opening could be placed over manholes of 1500 mm diameter.

29. Mr NARAYAN (Consultant, Pune) then agreed that Reinforced cement concrete (RCC) sewer pipes were the cheapest available, but were weak. Either pipes of greater strength had to be used, or encasement of pipes in concrete was necessary.

30. Mr AMBIKAR expressed agreement, adding that he did not like encasement because it created both future maintenance problems and settlement problems in soft ground.

31. Mr MUKHOPADHYAY (Water Supply Division, Calcutta Municipal Corporation) commented that the use of steel sheeting in place of wooden shuttering could create problems, and cited the following: a. The labour costs associated with the use of steel sheeting are greater than those for wooden shuttering. b. Considerable time is taken to make interlocking connections between adjacent steel sheets. c. If adjacent sheets are not connected together, it is difficult to fix them accurately in their correct positions d. When steel sheets are supplied by the department, the contractors do not value them as they would their own materials. The steel sheets then become damaged, making their use costlier than use of timber shuttering.

32. Mr MUKHOPADHYAY (Water Supply Division, Calcutta Municipal Corporation) also commented that RCC sewer pipes are not usually encased in concrete except in special circumstances. Their bedding, however, should be designed to suit the loading conditions and cushioning available.

R MOHANTY

33. Ms KATTICAREN (Netherlands Assisted Projects Office, Hyderabad) commented on the title of the paper 'Sanitation a way of life', and asked what components and activities could be planned to achieve the necessary cultural change in the community.

34. In answer to this, Mr MOHANTY suggested three components: a. The involvememt of beneficiaries, and others, in all stages of the programme, including decision-making. b. Bridging the gap, by any suitable means, between the beneficiaries and those responsible for programme implementation, so that the beneficiaries consider it as being their own programme. c. Encouraging a change of outlook that leads to a change in a way of life: from lack of sanitation to sanitation. This requires informing, educating and motivating people by various methods suited to the local conditions.

Mrs A MITRA

35. Mr BOYDELL (World Bank) asked how the latrines, within the West Bengal Sanitation Programmme, were financed.

36. Mrs MITRA explained that the substructures for the twin-pit latrines were provided free of charge to households as part of the GOI/UNICEF/UNDP-TAG programme in West Bengal. These substructures were constructed by the PHED for West Bengal. The superstructure was constructed by the families at their own expense using local affordable material. For another programme, that run by the WCC (Women's Co-ordinating Council), the beneficiaries are provided with several designs and budgets for superstructures, and the beneficiaries either provide the materials or pay for their cost.

37. Mr BOYDELL (World Bank) then asked a further question, wishing to know how the different types of superstructure were selected, and how the community responded to them.

38. In reply, Mrs MITRA stated that awareness programmes highlighted the variety of suitable superstructures that householders could construct at low cost. Various superstructures were constructed according to their affordability. The community considered that superstructures should, ideally, be made from bricks, because other materials need more frequent repair. They were, however, prepared to use whatever materials were affordable.

39. Mr LINGAIAH (Lecturer, Department of Public Administration, Osmania University, Hyderabad) posed a

question about motivation for the motivators. He wondered whether the metal badges, given as an incentive, were adequate; and what measures were needed to maintain the sustained interest of the motivators.

40. In answer to this, Mrs MITRA confirmed that badges had been given to the motivators in recognition of their status. This was not meant as an incentive, except perhaps in an indirect way. She said that opinions and policies differ widely on the issue of incentives for motivators. Motivational activities may be shared by a number of people at village level; schoolteachers, members of certain societies, health workers, youth club members, etc. Individuals may be selected as motivators for specific activities which can be done in their spare time. They may be given financial incentives for specific jobs such as surveys, monitoring, reporting, observable improvement at household or village level etc. Targets may be spread over a long period of time.

Dr BORGHEI (Sharif University, Tehran)
Mr BOYDELL (World Bank)
Ms KATTICAREN (Netherlands Assisted Projects Office, Hyderabad)
Mr LINGAIAH (Lecturer, Department of Public Administration, Osmania University, Hyderabad)
Dr MAHAPATRA (UNICEF, New Delhi)
Mr MATHUR (UNICEF, New Delhi)
Mr McINTOSH (Asian Development Bank)
Mr MOHANTY (State Sanitation Cell, Orissa)
Dr MOWLI
Mr MUKHOPADHYAY (Water Supply Division, Calcutta Municipal Corporation)
Mr NARAYAN (Consultant, Pune)
Ms RAHMAN
Mr SIDDHI
Mr SMITH (WEDC, Loughborough University)
Mr THAMPURAN (Superintending Engineer, Kerala Water Authority)
Miss ZACHARIAH (Socio-Economic Unit, Kerala Water Authority)

DISCUSSION GROUP REPORTS

16th WEDC Conference

Infrastructure for low-income communities

Hyderabad, India 1990

DISCUSSION GROUP REPORT
Community participation and management

CHAIRPERSON: P. Rajadurai Michael
RAPPORTEUR: Dr. Krishna Mahapatra

The group decided to structure the discussion by giving it a specific framework, as follows:-

a) Statement of specific issues for discussion;
b) Presentation of the prepared papers linked to the issues to initiate discussion;
c) Discussion reaching to recommendations.

All issues raised were mainly on the WHAT, the WHEN and HOW aspect of community participation and management.

The major issues raised, and outcomes reached, were as follows:-

1. In the WATSAN sector the gap between the rhetoric or strategy and implementation needs to be bridged through:-
a) Entrusting the decision-making power to the community;
b) Having participation from the community at the very beginning.

2. The perspective of implementors must change from seeing the community to be reached as "clients"; seeing them rather as equal partners in development.

3. For continuous participation and management the community must be empowered with information and skills.

4. Coordination is required between NGOs, different levels of government bodies and the community in terms of:-
a) balancing of interests;
b) NGOs and central/local government should be links or facilitators between the resources (information/technology/skill) and the needs (community/different stratas);
c) the participation of all the involved agencies should exist from the very beginning.

5. The institutional structure of government needs to facilitate the community participation approach through:-
a) institutionalizing the approach by working out specific steps and activities;
b) harmonious blending of the software and hardware inputs and systematic division of roles of all concerned for an integrated approach.

Some of the highlights of the discussion were issues relating to:-

a. The attitudes and roles/contributions of engineers vs social scientists (sociologists) in the development programmes. The debate continued and the gap existing was very evident, as was the concern for integration.

b. Communication was seen as a process, implicit in all that was being discussed and hence there was no need to separate it out for discussion.

c. Experiences from the ground showed possibilities and limitations of achieving community participation.

Finally some issues and questions were raised which could not be answered and remain as points to ponder -

a. Ideal vs actual - government systems and social systems have specific norms/policies which may clash with the community participation approach - what is the solution/middle path?

b. Community participation necessitates giving power to people - (knowledge/information/resources/decision making).

i) Does bureaucracy really want full community participation, or does it wish to operate within existing systems?

ii) Is society ready to take the responsibility of the outcome of this empowerment of people?

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DISCUSSION GROUP REPORT
Health, disease and health education

CHAIRPERSON: Dr M. E. Ince
RAPPORTEUR: Ms V. L. Shrestha

1. Emphasis on health education at the grassroot level/household level is the first necessity. -It can and should be promoted even where hardware inputs are not present.

Why? - it is people's behaviour that creates insanitary conditions that are linked to health.
How? - community-based organisations may be made responsible for advocacy and promotion of health education and monitoring. (Illiteracy is not a bar, and can be an advantage).
- identify primary messages (eg the hygiene message from 'Facts for Life' and promote them. They must be in keeping with local sociocultural traditions and institutional infrastructure.
- praise good, established practices and encourage their transfer.

2. A 'family' approach to health, water and sanitation programmes is vital. The involvement of women to the complete exclusion of men is not desirable.

3. For health benefits to accrue, continuity and sustainability of programmes must be built around accountability to the community. This:

a) requires flexibility in approach;
b) allows time for strengthening of the community and institutional infrastructure to support development;
c) links community involvement with that of administrators who are the policy makers and dispensers of government programmes;
d) offers a range of physical infrastructure (cost and technology) and facilitates selection by the community/family.

4. Coordination among communities, NGOs and government is essential at all levels: generally subsidies should not be encouraged, but where given, they should be uniform, to the poorest of the poor and at realistic levels.

5. Implementors should not try to deliver development but only act as catalysts to facilitate development.

This is linked to item 3 (above). Sustainability and flexibility is needed for strengthening of local infrastructure.

6. On-going training and education on health-related institutional and physical infrastructure is needed at all levels, not just at the grass root, family and technician levels. This is linked to items 1-5 (above) as reversion to former practices, (eg delivery and acceptance patterns) will occur without 'universal' awareness of the what? why? and how? of health, plus its reinforcement.

There is a need to put into action the rhetoric of development.

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DISCUSSION NOTE

A positive step towards continuity and integration into the mainstream government

Vijaya L Shrestha

RWSSP EMPHASIS

The twin emphasis of the Rural Water Supply and Sanitation Project are to 1)ensure access to safe and adequate water supply and, 2)promote health education and sanitation activities based on local realities and resources.

HESP: CONTINUITY AND INTEGRATION.

It needs no emphasis here that the improvement in health and environmental sanitation require changes in behaviour, which can be expected only through intensive and comprehensive health education programmes that allow continuity through regular contact, counselling and training.
HESP (Health Education and Sanitation Programme) thus has adopted an INTEGRATED mode of operation and implementation with INTENSIVE focus on village based health and sanitation related institutions/organizations/infrastructure; local health behaviour related informations; and local resources, health workers etc. In other words it draws the MAINSTREAM government services, INDEGENOUS institutions and PEOPLE that are of permanent and well established nature and located at the village/community level in the implementation process.

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1) The Rural Water Supply and Sanitation Project is a His Majesty's Government of Nepal/FINNIDA funded project. The agreement between His Majesty's Government of Nepal and the Finish International Development Agency (FINNIDA) was signed in November 1989. The project will cover all the six districts in Lumbini Zone.

2) Adviser, Health Education and Sanitation Programme,Lumbini Zone, RWSSP. P.O. Box 12, Yogikuti, Butwal, Nepal.

CONVENTIONAL APPROACH + CONSTRAINTS

While health education and sanitation is a component of almost all the Nepalese rural water supply project/programmes it is found to function as a separate entity, complete by itself and independent of the other existing health related programmes and infrastructure. This approach although helps to increase project efficiency, it greatly hampers long term sustainability as it has limitations in terms of time frame (projects have specified duration), targets to meet (most often ambitious and not taken into consideration of the nature of work, place and people) and territorial feeling. These limitations hardly allow or encourage to draw the relevant government infrastructure/services in the process.

NEW APPROACH

Integrated Approach. HESP is INTEGRATED because all of its health education and sanitation activities are carried out by the village based personnel from the mainstream health and education sectors. While it helps to strengthen and facilitate their capabilities and performances through performance oriented training and support services.

Intensive Approach. HESP is INTENSIVE because it emphasizes on continuity and relevancy as its activities are comprehensive and based on local health and sanitation related behaviour problems and resources.

HESP ACTIVITIES are to:

a) Strengthen institutions, organisations and groups for better impacts, efficiency and capabilities of the workers through training and support services

b) Relate health education and sanitation with rural realities through development of health behaviour data base for the use of health post and village based parameds/health workers

c) Relate preaching with practice through improved

- School sanitation
- Water source surrounding, washing and bathing place, soak pits/proper drainage.
- Health post sanitation.

d) Suggest and promote technology that are safe, efficient, practical and affordable i.e. soak-pit urinals (school), latrines (pit, VIP, pour Flush).

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DISCUSSION GROUP REPORT
Housing for low-income groups

CHAIRPERSON: Prof. S. Ramachandran
RAPPORTEUR: Mr M. D. Smith

Introduction

The group identified particular aspects that individuals wished to discuss. Discussion started with acknowledgement of the importance of appropriate low-cost materials. The group attempted to identify the basic criteria that should be generally applied.

Relevant factors affecting the selection of Low-income House-building materials
- are the materials available locally?
- can the materials be processed locally?
- are local skills adequate?
- is the increase of value resulting from local processing of materials being maximised?
- are energy requirements being minimised?
- are the materials socially acceptable?
- do selected materials minimise environmental degradation?
- do materials result in an adequately durable form of construction?
- do the selected materials lead to cost-effective house construction?

The aspect addressed was the question of acceptance. There were problems of social acceptability when using local materials instead of more attractive imported products. Demonstration projects were cited as valuable tools in communicating ideas, and this led on to discussion of agency roles in improving low-income housing.

The main agencies were identified as follows:-
- central government, government development agencies, state and local governments etc
- academic and professional institutions
- NGOs
- private sectors
- banking institutions
- donor agencies
- beneficiaries

Discussion then turned to how each of these agencies can help to facilitate the use of more appropriate materials for low-income housing schemes.

Government

Government should facilitate work in the low-income housing sector, rather than concentrate only on major construction.

Ways of facilitating include:
- planning (guiding development)
- access to land, and acquisition procedures
- providing infrastructural support to facilitate site development
- establishing favourable financing strategies
- developing building methodologies etc.
- stimulating research activities; in particular for appropriate materials
- stimulating private sector activities

Governments also have a key role in evaluation, monitoring and feedback.

Academic/Professional Institutions

The principal roles for these institutions are:
- instilling appropriate concepts through teaching and learned society activities
- encouraging appropriate applied research
- increasing coordination between academic institutions and housing agencies

NGOs

NGOs can assist in the following ways:-
- by acting as effective 'intermediaries' (negotiating standards, suitable methods of finance, transfer of technologies, etc)
- by helping in motivating communities
- by providing training and skill development
- by acting as an alternative low cost housing construction agency
- by emphasising the integrated approach to housing

Private Sector

The private sector needs to be encouraged to take a greater involvement in low income housing (via government policies).

Financial Institutions

Financial institutions should be encouraged to:-
- favour economically weaker groups of individuals and also cooperatives
- provide soft loans without security (similar to the Rs 10 000 available for development assistance. This could be extended to low-income housing)
- ensure adequate lengths of time for repayments (through financing)
- increase availability of loans and show greater confidence in borrowers (loans should be made available to women)
- simplify procedures, minimize rules and facilitate access
- encourage, and provide incentives to provision of finance for houses using low-cost materials

Donor Agencies

Donor agencies should work to guidelines and principles that are compatible with low-cost, self help housing policies.

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DISCUSSION GROUP REPORT
Planning and land improvement

CHAIRPERSON: Farooq Azam Khan
RAPPORTEUR: Mr M. D. Smith

a. Planning

Important factors that need to be considered when planning land development are:-

i. availability of adequate areas of land in places where people wish to live;
ii. transportation needs;
iii. strengthening the linkages between short-term and long-term plans;
iv. energy needs and energy resources available;
v. *improving land recording systems by supplementing existing systems with more* modern methods.

b. Land as a resource

Options such as Land Banking, enforcement of Land Ceilings, Land Readjustment, and Land Purchase or Acquisition have been used to make more land available to low-income groups in both rural and urban areas. All of these options present problems of application or implementation.

The problem of land availability in both rural and urban areas needs to be considered with the objective of reducing the rural-to-urban migration trend.

Migration from rural to urban areas occurs because of poor opportunities to earn a livelihood in rural areas. Land, as a sustainable resource, is underutilized and is gradually being reduced to a state of low productivity and low fertility, thereby encouraging the migration of low income groups. There is now pressure for efficient use of those areas of land for migrating low-income groups in urban areas.

Suitable measures should be identified and taken to train low-income rural communities in the use of appropriate management, scientific and technical methods so that land in rural areas may be put to optimum use for agricultural or other productive purposes. Enhanced self-respect and low migration rates would be the expected benefits of improving the opportunities for productive rural employment.

c. Planning for infrastructure

Planning for infrastructure should attempt to integrate the various resources available, such as water, soil, and local knowledge. The recommended unit for development is the drainage basin, and development should be ecologically sustainable, strengthening the rural infrastructure and economy.

Low-cost rural road networks should be provided on a phased programme, using indigenous materials and labour-intensive methods.

The social infrastructure should plan and provide for health and education facilities which are accessible and affordable by both rural and urban communities.

In the area of health, the promotion of traditional health sytems should be encouraged. Similarly, in the area of education, functional literacy and skill development should be emphasised.

Introduction of a national energy policy is recommended, especially in relation to afforestation and use of fuel for cooking. Energy for cooking accounts for 28% of India's total energy consumption.

d. Land improvement

Efforts should be made to reduce soil erosion, by encouraging afforestation and provision of vegetation cover. In addition there is a need for regulation of the use of chemical fertilizers and pesticides, and education as to their correct use. Studies relevant to soil conservation and land capability are needed in order to make the best use of natural resources to permit sustainable development. Possible measures could include the preparation of land capability maps, use of alternate cropping systems, use of traditional seeds and organic farming, and the use of marginal land for pasture.

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DISCUSSION GROUP REPORT
Management of water supply and sanitation programmes

CHAIRPERSON: Prof. G. Ram Prasad
RAPPORTEUR: Jon Lane

1. NGO's plans should be coordinated with national plans. Improved flow of information between NGOs and governments should be encouraged. International NGOs should have a clear function in supporting training and innovation.

2. Governments should fix national policies, and donor agencies should work within this broad framework. Where policy is unclear or incomplete, donors should inform and support the government.

3. a) Operation and maintenance costs of both water and sanitation projects should be fully recovered.

b) Tariff structures should be such that income inequalities should not be made more extreme.

c) The basic needs of the poor should be met, if necessary, by "life line" supplies.

d) Projects should be designed with appropriate technologies and training of personnel (in relation to social needs) in order to ensure proper operation and maintenance by the community.

4. Collection of appropriate base line data, monitoring of on-going projects and the evaluation of their performance should always be carried out. The evaluation should cover technical, economic and social factors, and the results of evaluation should be used to improve future practices.

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DISCUSSION GROUP REPORT
Finance and management

CHAIRPERSON: Prof. K. V. Srinivasan
RAPPORTEUR: A. McIntosh

1. It is recommended that as a minimum, operation and maintenance costs should be recovered from the consumer. The mechanism for recovery should be appropriate to the community served and acceptable to them. The objectives should be the efficient use of resources and to be equitable. Prior to the start of projects there should be an awareness campaign with funds for this purpose separately categorized. More emphasis should be given to maintenance as a separate component at the project conception stage.

2. It is recommended that per capita investment guidelines should be issued for infrastructural investments. Separate guidelines should be issued for both the urban and rural sectors. Capital investment should be based on appraisal, and preferably from a 'bottom up' request.

3. It is recognised that management in general, and financial management in particular, are crucial to successful operation. Therefore, it is recommended that:

i. managers should be specifically trained, and this training should include basic finance;

ii. managers should be free to manage and not bound by political constraints; local or national.

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DISCUSSION GROUP REPORT
Involvement of women

CHAIRPERSON: Shri D. G. Rama Rau
RAPPORTEUR: Ms Elizabeth Zachariah

1. Involvement of women should begin at the most basic levels in all aspects of development - not only in the water and sanitation sectors. Aspects of involvement should include financial and programme management.

2. There is a need to educate and inform communities and to build on their unarticulated basic needs.

3. Priority should be given to organizing women's groups for development.

4. Physical and human development should be integrated.

5. Economic empowerment of women, along with social development, is necessary.

6. A total approach to the process of developing programmes is important to achieving the objectives.

7. Systems need to be developed for qualitative evaluation to measure or quantify the development and empowerment of women.

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DISCUSSION PAPER
Empowering women

Professor D Ravindra Prasad

Urbanisation in India is on the increase. One of the challenges of urganisation is the growth of urban poverty and problems of dealing with the poor. In India. 27.7% of the urban population, in absolute numbers 50.5 million people, live below the poverty line. Out of them, more than two-thirds are women and children. Most of the urban poor live in slums without basic infrastructure to have a reasonable quality life.

After independence, several policy interventions were made and programmes were articulated to improve the conditions of the urban poor. One programme, Urban Basic Services (UBS), aimed at improving the quality of the life of the urban poor with special emphasis on women and children. Objectives of the programme are to:

- reduce infant/child mortality and morbidity;
- increase learning opportunities for children and women;
- enhance the skills and capacities of women;
- empower people;
- build municipal capacity to implement programmes for the urban poor.

One of the important features of the UBS Programme is the Neighbourhood Committees (NHC) consisting of Resident Community Volunteers (RCVs) taking the responsibility for planning and implementing the programme in their slums. The programme is tied to the community from decision making to monitoring and evaluation.

During the last five years, about 350 NHCs were constituted with more than 3,200 in sixteen towns in Andhra Pradesh under the UBS programme. It was envisaged in the aims and objectives of UBS that the emphasis was on women and children, empowering women and providing learning opportunities for them to enhance their skills and capacities.

An important aspect of the UBS programme in the states of Andhra Pradesh and Orissa is that the NHC consists of only women. This is a conscious decision taken by the governments, deviating from the programme guidelines issued by the Central Government.

In the initial days of the programe there was some resistance from the community for allowing the women to participate in development activities. This has now largely been overcome.

Now the women have enhanced their capacity and status in the community. Men take more interest in the needs of women and encourage them to participate actively in the UBS programme. The RCVs undergo training and orientation, exchange visits to other towns, district headquarters and state capitals and even in other states. They gain self-confidence and courage, and participate on a par with men.

The women are now able to directly approach the government officials, banks, etc and represent their problems. The men are not only happy about the way the women members of the community are doing all these things, but also they agree that in some aspects, the women know better than them.

Problems and Prospects

The programme has made a substantial contribution in improving the physical infrastructure for the urban poor and services in the fields of health, nutrition, education and economics. However, there are a few problems and issues which need to be addressed in the future.

(The original paper has been edited for inclusion in the Proceedings)

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DISCUSSION GROUP REPORT
Low cost sanitation

RAPPORTEUR: Richard Franceys

The group considered the needs of low-cost sanitation under the headings of Policy, including subsidies and environmental issues; Technological Choice; User Participation; Health education; and the Integration of Sanitation with Water Supply, Health and other activities.

It was agreed that there should be no subsidies for sanitation. There should be payment for health education to promote the demand for sanitation. There should be demonstration units provided free of charge to schools, health centres and other institutions.

The justifiction for this 'no subsidy' approach was that there are low-cost sanitation options which are affordable. It was recognised that twin-pit pour-flush latrines are at the expensive end of the low-cost sanitation spectrum, as sanitation begins with the use of a shovel to cover excreta.

Health education can be used to generate the demand for better quality sanitation, accepting that privacy, status and convenience are the usual motivating factors.

Components for latrine construction should be made available not only through projects but also through traders and merchants.

It was acknowledged that people, the users, are vital for the effective design of sanitation systems in any particular area. They have the knowledge, intelligence and experience to make best use of local resources.

Focussing finally upon the particular needs of urban areas, the work of Sulabh International was recommended as a model for other NGOs, both for its communal latrines where people pay a small fee to use the facilities; and also for its promotion of household latrines.

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DISCUSSION GROUP REPORT
Rural water supply technology

CHAIRPERSON: Mr Narayan
RAPPORTEUR: Mr. M. D. Smith

1. Water as a resource

Suggestions: Mismanagement of water is common in villages, water resources are not evenly distributed and demand also varies. Watershed management of traditional and new sources is therefore urgently needed. Excavation of new ponds or tanks is not recommended. Possible water sources include: tanks, dug wells, shallow tube wells, deep set tube wells, existing surface water sources. First priority should be given to satisfying domestic demand. Only then should industrial and agricultural demands be considered.

Protection of groundwater quality and quantity is needed, giving priority to groundwater for use as drinking water.

In Nepal, small sources are being reinstated, at the same time as development of larger schemes. Thin plate weirs, such as vee-notch weirs, can be installed to measure yields from sources which have not been thoroughly measured.

Only a small investment in structural work is necessary to collect useful data on small water source yields. Small water sources should not be neglected. Deforestation and clearance of vegetation reduces the yields from small sources.

2. Wells (excavation and construction)

Existing knowledge is adequate for developing shallow tube-wells and hand-dug wells. Manual drilling of intermediate sizes (say 100 mm or 200 mm for deepset tubewells) is difficult. Drilling options are hand augers (difficult to purchase); and hand operated rotary drill with mud circulation or jetting. The drill casing would need to be introduced after excavation and the density of the drilling mud increased as necessary for soil stability.

The apron around wells should be either sufficiently large to contain all spilled water from water collection, washing and laundry; or smaller, accepting that some pollution around the water-points is tolerable. There is a difference of opinion about these two alternatives. Studies are desirable to establish what size of apron is best.

3. Declining water table

A major cause of the declining water table is deforestation, removal of vegetation and mismanagement of water bodies. Percolation tanks, contour-bunding and other techniques are necessary to delay the run-off of surface water. Watershed management should be immediately introduced.

Opinions differed about the relative benefits of tube-wells and ring-wells.

4. Rejuvenation of handpumps

There is a need for existing handpumps to be renovated. Common faults include -

- clogging of the strainer or well-screens;
- wells having been built when the water table was high;
- well-screens clogged by salts;
- the riser pipe being too short

Skills are often available locally for handpump repair and maintenance: the availability of spares is a more serious problem.

It was suggested that whenever a handpump can be rejuvenated, this should be attempted in preference to replacement.

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DISCUSSION GROUP REPORT
Slum Improvement/upgrading

CHAIRPERSON: Farooq Azam Khan
RAPPORTEUR: Alistair Wray

Two initial questions can be considered in approaching the subject of slum improvement and upgrading:

a. why do slums exist? and
b. how can they be improved?

Slums developed due to reasons of economic disparity and the bias of development towards urbanareas, which led to better health and education facilities as well as employment opportunities in towns. Both inter-country migration and migration due to natural disasters were also contributary factors in some cases. Slums have grown rapidly. As an example, surveys in 1979 indicated 450 slums in Hyderabad, rising to 665 slums in 1987: a 50% increase in eight years.

What are the characteristics of these areas?

- lack of availability of essential services and adequate housing
- illegal occupation of the land is common but is not always the case
- high density is also a feature in Asia but again is not always the case.

Principles of Upgrading

- clearance policies have failed in the past and there is therefore recognition of the role of improvement (for example; the Indian Environment Improvement of Slums Programme where resources are allocated to local bodies).
- residents should be helped to help themselves and also to make the best use of what is available (ODA programmes, voluntary relocation etc). The Orangi Pilot Scheme is a good example of what can be done.
- communities should be strengthened to enable residents to find out what they want and what they can do. No magic formula or order for the steps in improvement work can be given.
- any approach should look beyond the immediate improvement requirements and towards sustaining these improvements and expanding them in the future. This will involve training, both mental and practical; and will involve NGOs, community units and other groups.

RECOMMENDATIONS

1. Before carrying out any programme of introducing improvements, a prerequisite and pre-condition should be the formation of a sound community organisation.

2. Sustainability should be examined at each stage of improvement work and for each participant in the process.

3. Training, addressed to all those involved in the improvement activities, is essential, and must be appropriate to the roles which they have agreed to undertake.

4. The approach should be flexible and comprehensive (regarding order of work, choice, elements covered etc).

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DISCUSSION GROUP REPORT
Involvement of NGOs

CHAIRPERSON: Susan Jones
RAPPORTEUR: Farooq Azam Khan

Three discussion papers were presented, namely: "An overview of the NGOs' dilemmas operating in India" by Dr Venkat Rao; "User participation - role of Voluntary Organisation" by Mr Yadoti; and "NGOs and women in WASH projects" by Rebecca Katticaran. A range of issues pertaining to NGOs were identified, some of these being:

Paper I:

- There is no understanding of NGOs by governments.
- NGOs face the dilemma of fund raising and trying to do the job at the same time.
- The self reliance of a client community is only achieved at a high cost and has problems of replicability.

Paper II:

- The first step of any project should focus on the user.
- Software should come first, followed by the hardware.
- Sanitation programmes may be linked to other programmes (ie health, community and social development) and should be approached in the knowledge of possible links.
- NGOs are growing fast and have problems in both management and administration.

Paper III:

- The strategies or approaches adopted by NGOs should, where possible, be replicated by the Government Agencies.
- NGOs should have a role in the institutional development of government organisations.
- The potential for two-way communication and partnership between NGOs and government should be developed.

Three main topics were identified for futher debate:

(i) The roles NGOs can and do play.
(ii) The organisation of NGOs, particularly as they develop.
(iii) The inter-relationship/coordination between NGOs.

Recommendations

1. NGOs should complement/act in cooperation with the Central/State governments and not operate independently.

2. There needs to be awareness/recognition at government level of the roles/possibilities of NGO activity.

3. There should be a "software" person in the government and a small funding allocation to promote and co-ordinate NGO activity at the Central/State government level.

4. NGOs should operate within their objectives and not have to change these to fit in with funding agency (particularly international agency) requirements.

5. An umbrella organisation is rquired to ensure networking among NGOs and dissemination of information.

6. Training programmes are needed to help NGOs organise their work, respond to building up their capacity, improve their financial accountability, etc.

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DISCUSSION PAPER

The political rhetoric and the persistent need

Dr P Venkat Rao

The well rehearsed dialogue on development in the world as a whole centres around one word 'partnership'.

One must suspect all power elites who talk the language of the rebels, be it at international levels or within the low income community nations.

As an example of the political rhetoric; for the 1991 World Conference on 'Our Common Future', the General Assembly of the UN defined the form and manner of (NGO) participation in the preparatory process and the conference: The NGO Community is to be allowed at most to 'enrich and enhance the deliberations of the conference' and to 'serve as an important channel to disseminate its results, as well as mobilize public support'.

In India Laddakh could benefit by rural development interventions by NGOs, yet hardly any development work goes on. In Sri Lanka, NGOs can only take up relief work. In Malaysia, environmental NGOs who protested against large scale timber felling were jailed. In Sarawak, NGOs are now allowed. In Thailand, NGOs protest against all forms of prostitution sold for the tourists, but the government continues to remain a silent spectator. Yet in all these countries political elites continue to shout from SAARC, RECSAM, NAM, UN and other international bodies, about human issues, rights of freedom, fundamental and more concrete changes in the very structure of their social fabric. They continue to eulogise the role of NGOs in building up the grass roots for development.

The ability of modern power elites to work out ways of coming through crises with their power intact should never be underestimated. The first instinct of those in high places when faced with a problem is to avoid analysing its causes if doing so would put the current power structure in an unfavourable light.

THE STAGE

Low income nations like India have common bases that include inadequate agricultural growth and insufficient breadth of industrial structure. All forms of credit are basically repressive, no matter who provides it. Borrowing is done not to increase production, but in order to maintain production and to meet pressing consumption needs. It is difficult to repay loans from a stagnant low income.

In India a final push for NGO coalition was talked about in the Seventh Plan. But when the average official thinks of NGOs, he thinks of Rotary, Lions and the Jaycees and of course the Mahila Mandals. NGOs can implement rural development programmes, yet there is a deadening impact on any effort to bring about improving the living conditions of the poorest. Sheer distance and isolation kills any enthusiasm one might have at the initial stage of one's career in rural areas.

CONSTRAINTS OF NGOs

NGO structures are difficult to sustain, let alone replicate on a larger scale, because of problems of organization and management, and because they do require large amounts of monetary resources. NGO staff do not receive support from local elites, petty bureaucrats and such other government functionaries, who may often threaten the very existence of the NGO.

NGO ideologies may pose a variety of problems. Sympathetic support may be lacking; and growth may result in a change of priorities so that house-keeping and attainment of objectives at the grass roots assumes great significance while the people (target groups) assume secondary status. NGO networks are usually unable to speed up development of social policies because most of them do not see eye to eye with each other.

There may also be problems with the leadership structure in NGOs. NGOs started by charismatic leaders usually go on smoothly but one sees problems posed by expectations of workers to conform within the NGO. There is seldom any exchange of information from which experiences of success and failure may be shared. There is the additional danger of succumbing to the whims, fancies and political designs of the donor agencies, due to prolonged financial dependency on them.

Apart from this is the dilemma of finding qualified and professional manpower for NGO objectives. Attempts to find qualified manpower are thwarted by the low salaries, lack of perks and limited opportunities. In the last decade some senior NGO leaders have considered providing long term employment contracts and incentives to their staff. Unfortunately too little attention is being paid to the issues of employee motivation and development in the Indian NGO sector. This may be one of the reasons why there are so many NGOs which only operate for a few years.

The author is grateful to Professor D Ravindra Prasad, Director, RCUES, for various suggestions in developing this paper.

(The original paper has been edited for inclusion in the Proceedings)

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DISCUSSION NOTE

User participation - Role of voluntary organisations

Narasimhaiah Yedoti

Sanitation for the low income communities, unlike public water supply is considered as a household facility. When household facilities are acquired by individuals in a community, they are not considered affordable by the poor.

Much has been said and done about community participation for low-cost sanitation. Many voluntary organisations use comunity participation as a tactic to extend sanitation facilities to their target population. Voluntary organisations should aim at bringing a fundamental change in the knowledge, attitudes and practices of each user in that particular community. This is possible if we focus our attention more on educating individuals.

To achieve this fundamental change in the users in a particular community, voluntary organisations should focus their attention on the following:

1. Sanitation problems to be included with other educational programmes.

2. Sanitation problems should be highlighted as social problems rather than only as health problems.

3. Local taboos must be studied. (For example : the latrine should not be within the house; a facility used by the head-man of the family should not be used or touched by the younger generation, defecating on the faeces of other people will bring evils, etc). After analysing the facts about these taboos explanations as to why they are not correct should be given to the users.

4. Collect the opinions of the users about sanitation. Build up the plan of action accordingly. Involving the users from the planning stage onwards is a powerful tool in the ultimate succes of the whole programme.

5. Details of advantages and disadvantages of having a sanitary facility should be explained in detail and repeatedly. Education should not be of a "hit and run" method.

6. The focus must be on each user, rather than on a group of people who can influence the community. These influential people will talk to the community in an authoritarian role rather than sharing with the people. Voluntary organisations can do a better job in this direction.

7. The place and time of educating the users is very important. We must adapt to suit their leisure times.

8. Alternative designs. When we explain about sanitation users will be curious to know about the designs and other details. We must have enough literature about different models in the local language. Users should be encouraged to study the models and select a design that suits their requirements.

9. The people will then be ready to take up the programme. That is the right time to launch the construction of sanitary facilities for better and long-term use. To ensure proper participation, a village sanitation committee should be formed and given the responsibility of planning, monitoring, construction and follow up work. While forming a sanitation committee, care should be taken to see that women, young people and poor people are included in the committee.

10. The user who is involved at all stages of the project will have a sense of ownership and pride in maintaining the asset created.

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DISCUSSION PAPER
NGOs and women in water and sanitation projects

Rebecca Katticaren

1. INTRODUCTION

a. These discussion notes are rooted in my experiences with bilateral and multilateral programs in the basic infrastructure development sector.

b. Despite the well laid down concepts regarding participation, present strategies are a far cry from ideals of "involvement of the local population actively in the decision making concerning development projects and in their implementation".

c. Community participation has been no more than the involvement of the local population in implementing a decision taken at a higher level. It has often been only an after-thought. What then is left for peoples' participation? Well, people could be involved in the location of public stand posts and also in planning strategies for the implementation of hygiene/health education, sanitation programs and village level operation and maintenance of the water supply systems.

d. Is a gradual shift in the definition of community participation - from mere implementation strategy to consultations in decisions along with responsibilities for all involved in the consultations - a feasible policy option?

2. KEY ISSUES IN INVOLVEMENT OF NGOs AND WOMEN

a. In bilateral and multilateral projects, despite talk about participation; appraisal/evaluation strategies are predominantly concerned with achieving targets.

b. Implementing agencies, target and technology oriented as they are, are little prepared and equipped to grapple with the concepts and implications of participation, let alone make institutional modifications in terms of response and facilitation.

c. Are programs specifically for women valid and relevant in the rural context?

d. Water/sanitation projects, especially the larger ones, are not responsive to the dynamics from below. They are decided on the basis of specified criteria and are sometimes politically manipulated. In such situations, it is merely a coincidence when articulated felt needs or competent catalysing agencies are present in the proposed project areas. Very often NGOs have to be imported.

e. Given the time and personnel constraints, aid agencies generally look to large NGOs, who often ignore whatever local initiatives already exist.

f. Is there any real scope/flexibility for a two-way process of partnership?

3. INSTITUTIONAL DEVELOPMENT

a. Changes in aid-mechanisms and institutions occur, and may be constructive.

b. If project objectives of aid-agencies are different from the latent but real objectives of implementing agencies, there can be no meeting point. We should not equate lack of correspondence between donor objectives and implementing agency performance as incompetence.

c. A deliberate effort needs to be made from the start to motivate and equip the implementing agency to the objectives and strategies of participation. Institution development is either inbuilt or it never happens.

d. Donor strength should not be used to force strategies on implementing agencies. The broad political environment has also to be addressed by any project that hopes to sustain and spread its development philosophy.

e. Is it feasible for projects to link up, coordinate and provide support to existing initiatives, without large infrastructure?

f. Water and especially sanitation are not the felt priorities of the rural poor. Do projects have the flexibility to address themselves to a wider spectrum of need than those spelt out in project documents?

4. CONCLUSION

Involvement of women and of NGOs in bilateral and multilateral projects is still a new concept in India. Government departments/agencies must equip themselves to accept the significance of such external interventions. This is understandable especially since such programmes constitute no more than a tiny percentage of the total development effort.

If projects do not bring about anticipated results, we may require more than evaluations, reviews, impact studies, etc. We may need to take a deeper look at the sector realities as a whole, to the latent goals, perceptions, blocks and constraints that exist in the community and outside of it.

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DISCUSSION GROUP REPORT
Irrigation and rural infrastructure

CHAIRPERSON: Ziauddin Ahmed
RAPPORTEUR: Mr M. D. Smith

Road construction in rural areas should use suitable materials, construction methods, and be economical, producing durable roads.

On the subject of flood control in Bangladesh it was considered that there should be joint collaboration between the Governments of India and Bangladesh to dig canals to control the floods. Small scale irrigation in Bangladesh should be encouraged. This means provision of protection against drainage congestion and against massive rain floods. Flood prevention is not possible but control of floods is possible, with flood protection works providing some employment. Some flood water can be stored and this can be used for irrigation. The cost of flood damage often exceeds the sums spent on flood control systems. Effective flood control can minimise soil erosion.

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DISCUSSION PAPER

Low cost, labour intensive road construction trial

Syed Mohitul Islam

1. Background

Conventional methods for construction of road pavement structures in Bangladesh are quite costly both from construction and maintenance points of view.

In order to study and identify suitable tpes of labour-intensive, low-technology, semi-pucca (semi-genuine) all weather roads for rural Bangladesh, experimental projects with different pavement sections were tried - one in Rajbari district (in 1985-86, Intensive Rural Works Programme - IRWP) and the other in Faridpour district (1988-89, Rural Employment Sector Programme - RESP) of Bangladesh.

The findings of the first trial formed the basis for selecting types of pavement (with varying parameters) in the 2nd trial in order to confirm the suitability or otherwise of specific type(s) in relation to cost labour-intensiveness, minimum deterioration and maintenance under normal traffic.

2. Types of Pavement Selected for Trial

Eleven types of trial pavement sections were selected and compared against the conventional Herring Bone Bond (HBB) pavement construction. Variations of the HBB were studied, as were pavements using stabilised soils.

3. Final Design and Selection of Materials

The objective of the trial was to develop some cost-effective pavement structures. Emphasis was placed on evolving designs which utilised locally available materials and labour. For this, materials survey, soils investigations and testing was undertaken.

For pavement design, codes and publications from Bangladesh, Britain and elsewhere were consulted. Eleven types of pavement sections were selected finally for trial.

4. Implementation

The project was implemented by the Local Government Engineering Bureau (LGEB) of the Ministry of LGRD and C (GOB) funded by Swedish International Development Agency (SIDA) and Norwegian Agency for Development (NORAD) in the Infrastructure Development Project (IDP) of the Rural Employment Sector Programme (RESP). The estimated cost of the project was Tk34.0 lakh and it has been completed at a cost of Tk37.40 lakh. The period of construction was six months starting from January 1989. The total trial length was 2100 m, divided into 11 different sections. Ten lengths were of 200 m for 10 and one was of 100 m.

The nature of the project required extensive quality control measures to fulfill the technical aspects of design. An adequately equipped laboratory was used to ensure adherence to the specification.

The post construction monitoring of the project started in July 1989 and it is expected to continue for a further two years. Observations from this monitoring period will form the basis for drawing up definite conclusions from the trials.

5. Major Findings

Of all the eleven pavement sections the Aggregate Stabilized Soil Roads (types 06 to 10) exhibited the most promising characteristics such as -

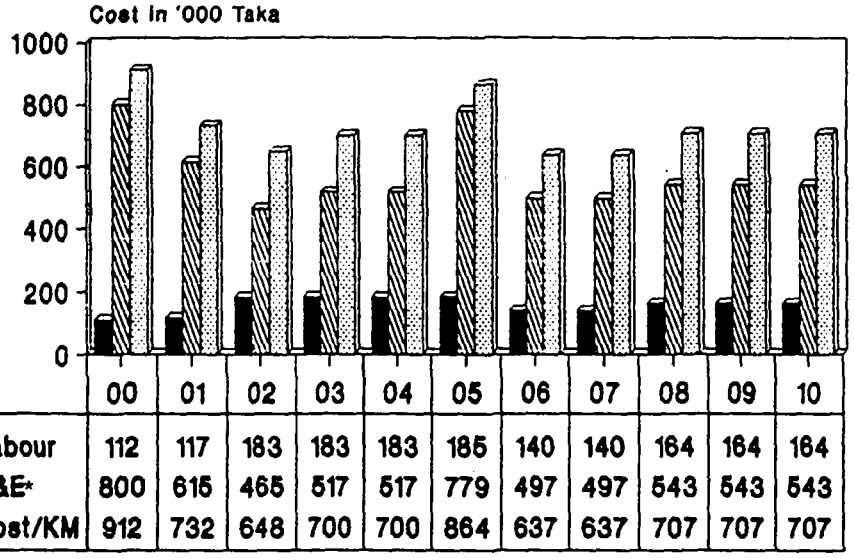
- cheapest in terms of initial investment and one year maintenance cycle
- reduced use of bricks
- adaptability of construction techniques to suit local labourers
- cumulative advantages over all other types

6. Conclusions

The trial construction was completed in June 1989. Also there is a monitoring period for one year to assess the performance efficiency of the pavement structure. It is premature to draw definite conclusions. However from the observation and records during construction and post construction monitoring period the Aggregate Stabilized soil, topped with 25 mm brick aggregate over sand soil sub-base and surface treated with a thin layer of pre-mixed bituminous seal coat, type 09, appears to be promising, suffering no noticeable deterioration during this period.

For the interest of national economy and on strong technical reasons, road building agencies should come forward to take up similar projects involving technological innovation and advancement with cost-effectiveness in the design and construction of road works.

Road Construction Trial Project,Faridpur
Cost comparison between individual pavement structure



	00	01	02	03	04	05	06	07	08	09	10
Labour	112	117	183	183	183	185	140	140	164	164	164
M&E*	800	615	465	517	517	779	497	497	543	543	543
Cost/KM	912	732	648	700	700	864	637	637	707	707	707

* Materials & Equipment

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DISCUSSION GROUP REPORT
Management of solid wastes

CHAIRPERSON: Dr N. K. Upadhyay
RAPPORTEUR: Heinz Boeni

Following discussion based on the paper 'Recycling of clothes imported from abroad', the following conclusions and recommendations were made.

1. Waste reduction, waste re-use and recycling should be encouraged.

2. The separation of clean waste, at the source or as near as possible to it, should be promoted.

3. Low-income communities should be enabled to participate in economic recycling.

4. In order to avoid exploitation of labour, there should be cooperatives and such organisations so that a fair profit goes to the people.

5. With efficient recycling of synthetic materials importing becomes more feasible and should therefore be adopted whenever possible, emphasising the marketing of these materials.

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DISCUSSION PAPER
Recycling of clothes imported from abroad

Ramala M Baxamusa

INTRODUCTION

In developed countries the disposal of waste may be difficult. Recent economic development in the textile industry (eg the great increase in man-made (synthetic) textiles) has led to a rapid growth in the recycling business. Most of the requirements of clothes, both in the form of textiles or ready-made garments, are met by the developing world. Thus clothes in the west are relatively cheap, and many people change their wardrobe every year as a consequence of fashions changing rapidly. In developed countries, people seldom use clothes until they are worn out, so that people dispose of clothes which are almost new, but old-fashioned. A few agencies organise door-to-door collection of old clothes. It is, however, very difficult for them to send these clothes to India because of the expense and import charges. Businessmen have therefore entered into the recycling market.

METHODOLOGY

This study was conducted primarily through interviews with workers in various sections in the trade, including shop merchants, workers and importers.

Disposal of material from the developed world can cause pollution and is wasteful of natural resources. For the last two decades, waste clothes have created a good market for developing countries.

Merchants generally prefer to trade with eastern European countries because of favourable trade agreements, including barter (exchange of goods).

THE PROCESS OF RECYCLING

The shops which do the recycling work are concentrated in certain districts, which have spread. The shops get the rags and old clothes from the warehouse in handcarts. Costs vary following basic principles of supply and demand.

All garments need to be washed, and some may need minor repairs. Coats and trousers need to be ripped open and cut to smaller, Indian-size requirements. Jobs are shared out amont the workforce.

CONDITIONS OF EMPLOYMENT

In this profession approximately two or three lakh (1 lakh = 100 000) people are involved. It is mainly a male-dominated work, with women involved in finishing work. In most cases the working conditions are quite poor.

The workers in this trade are so badly paid that they cannot afford accommodation. They sleep on the street, inside the shop or under any available shelter. Their existence is almost inhuman; they eat at cheap eating places, bathe in the street outside their shop and use the common lavatory in the shop premises.

MARKETING

The goods once manufactured are sold all over India by merchants to other merchants or hawkers. The profit margin on these clothes is small, so hawkers move from place to place wherever people congregate.

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DISCUSSION GROUP REPORT
Sites and services

The following points were covered during discussion.

1. Sites and services in general
2. The importance of sites and services components
3. Policy options
4. The role of community participation
5. Implementation of sites and service programmes
6. Identification of beneficiaries and sites
7. The role of Government Agencies
8. The role of financial institutions

These aspects were discussed at length by members of the group, based on their own experiences.

The following rcommendations and suggestions were reached, following discussion.

1. Identification of beneficiaries should involve NGOs.
2. Identification of sites should be based on community participation.
3. Services which are not easily accessible to an individual should be provided.
4. Suitable mechanisms should be developed to simplify repayment of loans.
5. People should be encouraged to form committees for further maintenance of services.
6. Education programmes should be used to make people aware of what forms of assistance are available.

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DISCUSSION GROUP REPORT
Urban water supply, sewerage and sewage treatment

CHAIRPERSON: Shri K. Naram
RAPPORTEUR: Mr Steven Sugden

1. Metering

The group recommends that continuous (24 hour) supplies should be used to facilitate metering. Comprehensive metering is recommended for large urban areas. This conclusion was reached after a review of the advantages and disadventages of metering.

2. Source Selection

Quality and potential source maps should be produced and maintained. These should be periodically updated.

3. Water Loss

The first step in reducing water loss is to set up small pilot schemes where losses (causes and amounts) can be closely monitored.

4. Maintenance of Water Supply

This should be a primary concern of every water authority. Specific funds should be allocated for this process. Maintenance requires accurate plans and records of the system.

5. Cost of Sewage Disposal

Where possible on site sanitation should be used. The cost of sewage disposal is often dependent on resources available.

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DISCUSSION PAPER

Public and private partnerships in the management of urban development

V. Gnaneshwar

1. THE CONTEXT

The deteriorating urban situation in developing countries - financial stress, fast growing slums, traffic congestion, social tensions, political extremism, environmental pollution, etc, is not going to change radically in the near future. Unless the urban managers see the realities, the situation cannot be improved for the better.

There is a need to be realistic and modest in attempts to solve the infrastructural problems in urban development. The financial requirements are even beyond the combined capabilities of central, state and local governments. It is in this context that the public-private partnerships become imperative in sharing the burden.

2. PUBLIC - PRIVATE PARTNERSHIPS - EMERGING SCENARIO

Private and public partnerships, hitherto neglected for various ideological reasons, assume significance in developing countries. Both the sectors have certain potentials and efficacies which could be combined to achieve the desired results. There are certain areas which can sensibly be passed on to the private sector while retaining the overall control with the government organisations. In the urban sector, housing and civil infrastructure (provision and maintenance of services) are potential areas for public - private partnerships.

3. HOUSING

The conventional methods of housing have become expensive, requiring massive subsidies which benefit very few. The construction of low income housing can be shifted to the private sector allowing the public authorities to concentrate on housing inputs viz., land, infrastructure, finance, building materials, construction capacity, etc, rather than on housing output targets. Flexible regulations, simple procedures and effective communication can solve more problems.

4. CIVIL INFRASTRUCTURE

In the vital civic areas like public transport, water supply and sanitation and solid waste disposal, there are a number of experiments in the developing countries in which the private sector has been involved in sharing part of the burden. There have been failures and successes, but there is scope for experimenting innovative partnerships based upon local conditions.

Selection of Options: The involvement of the private sector in the urban sector must be done gradually based on experimentation and experience. Which sector and which part of a service to be entrusted to the private sector depends on local conditions. The fact is that there is scope for private sector involvement in the public services and it can be exploited fully. Before doing that, certain factors must be considered. They are:

- Can it be done within existing laws? Are any changes required?
- Does the private sector have the capacity to perform it?
- What is the risk involved in service disruption?
- Social and political acceptablilty.
- Service quality and effectiveness.
- Financial costs involved.

5. CONCLUSIONS

To conclude, public and private sectors are to be viewed in mutually supporting roles. Each sector has certain merits which can be combined to produce optimum utilization of resources towards the desired objectives of development.

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CONCLUDING ADDRESSES

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PRESENTATION OF MOMENTOS

Prof. T. Navaneeth Rao

The President of this function, Prof. R.V.R. Chandra Sekhar Rao Garu, the distinguished guest of the evening, Shri V.P. Rama Rao Garu who is also going to give the Valedictory Address; Dr. Ravindra Prasad, Director for the International Conference on Infrastructure for Low-Income Communities; Professor John Pickford; Prof. Srinivasan; Dr. Lakshmipathy, participants of the International Conference; distinguished guests; distinguished members representing various organisations who have helped in organising this International Conference; my colleagues from the academic community; ladies and gentlemen,

I have not come to give a speech on this occasion. I have two reasons which attracted me to come here. One is the chief guest, the other is all the organisers, most of whom are my friends who helped in organising the International Conference for five days at the Osmania University. Prof. Ravindra Prasad has tried to educate me on what has happened in the last five days. I was very happy to see the time schedules and the programme and I am confident that you have thoroughly enjoyed your academic discussions during these five days in various sessions here. I am also happy to note that 20 countries have participated, and about 135 participants including 53 from other countries from far and near participated in this International Conference. I would like to take this opportunity to thank all the organisations and all our friends, friends of Osmania, who made this International Conference a success. Every evening, I get reports and my reports are that the deliberations have been going on very smoothly and very nicely, including the technical visits. The second interest which made me come is the chief guest, Shri V.P. Rama Rao Garu. Prof. Ravindra Prasad has said, he is a friend, philosopher and guide for most of the academics. For me also, as a Vice-Chancellor, he is a friend, philosopher and guide. Therefore, when he was Education Secretary, my interaction with him was such that he would make every academic feel the same way. Like a friend, philosopher and guide, he has been helping the Universities. During this, his first visit to the campus, I have come to welcome Shri V.P. Rama Rao Garu to Osmania University in his official capacity as the Chief Secretary of Andhra Pradesh.

Sir, this is not the occasion for me to welcome all the other distinguished members, because this is a Valedictory function. It is a closing session, but, I am confident, the organisers have made the participants and distinguished members very comfortable during these five days here. To the Chief Guest again, Sir, on this campus, we have been trying to see how the Institutes of Higher Learning can serve the social needs. We are not trying to maintain the ivory tower isolation. We are not trying to have only basic work whether it is in sciences or social sciences. We are trying to relate our research and training programmes with social needs. Because we cannot afford to ignore this particular requirement of reaching out to the society. Particularly the academic deliberations, discussions and training programmes should be such that we should be able to reach out to the community and whether it is social sciences or sciences, we should plan properly and try to implement the proper decisions taken after careful deliberation. We are trying to interact with government organisations, various non-government agencies. We try to interact with institutions, industries, banks, commerce and in fact, in all walks of life, we are trying to interact, trying to establish our relevance, trying to help the society at large. With this in mind, we have ben trying to even change the curriculum so that we can reach out to the society. I will not go into more details on this aspect of this University. We have now half-a-dozen centres in the University where multi-disciplinary research activities are going on. The Regional Centre for Urban and Environmental Studies is one of those Centres where social scientists, health scientists, civil engineering people jointly work, interact and try to help the community at large. At this international Conference on Infrastructure for Low-Income Communities, where the deliberations have been very clear and have adopted a multi-disciplinary approach. I am sure, the decisions which you have taken and the recommendations you have made, if implemented properly, will be very useful and beneficial to society as a whole. As I mentioned and as I see here, I am the only layman who has no expertise to talk on this particular subject. The Centre has research activities which I can describe partly, but I will not venture to do on this occasion. I have nothing more to say on this occasion. I can only mention that the very scarce resources which are being spent on higher education in this state; which are almost 20% or even more than 20% of the budget of the state should be spent well. On behalf of the University, I can assure the Chief Secretary that we will try to see to reach out to the society to help them in various ways in their daily activities. I would like to finally thank Mr. Ravindra Prasad. All of you must have seen him, he is a human dynamo; he is very active; a very dynamic person and is a very good academic. At the same time, he has very good organisational capabilities. I congratulate him for organising this Conference. When he told me one year back about the Conference, I immediately agreed to it. I believe that we should have more and more of this type of conference and interaction so that we can interact with various organisations who are also involved in such types of research. I would like also to thank him and his colleagues for asking me to come and participate in this Valedictory Function. And finally, I would like to thank all the distinguished guests who have come and participated in this International Conference. I would also like to make a mention we have amongst us Mr. Madan Mohan, the doyen of Electronic Industry in Andhra

Pradesh. He is the owner of this building and in a sense he manages it. The University gave some land and they constructed this building, and they are also reach out the community. I just wanted particularly to mention, training in Electronics and various other programmes in engineering, Throughout the year there are programmes of continuing education throughout the year helping the society at large. More and more we are going to have such activities on the University campus. I would like to thank Mr. Madan Mohan for providing this hall and the facilities.

Thank you very much.

16th WEDC Conference

Infrastructure for low-income communities

Hyderabad, India 1990

VALEDICTORY ADDRESS 1

Shri V. P. Rama Rao

Prof. Chandrasekhar Rao Garu, Prof. Navaneeth Rao Garu, Prof. John Pickford, Prof. Ravindra Prasad Garu, Prof. Srinivasan, Dr. Lakshmipathy and distinguished members of the gathering,

Permit me at the outset to express my feelings of deep happiness at being associated with this International Conference on Infrastructure for Low-Income Communities. I am extremely pleased to note the very wide representation of academics and professionals from different parts of the world. Prof. Pickford pointed out that learning remains a perpetual process, and in the process of learning, nothing helps more than sharing the experience from countries far and wide.

I become nostalgic whenever I attend this type of conference. I was associated with an academic institution involved in the field of international trade as its Director-General for a couple of years and we used to organise international conferences very often. Each time that I could participate in such conferences, I used to experience a definite sense of fulfilment and of learning something new.

Turning to the present Conference, the theme *Infrastructure for Low-Income Communities* happens to be a matter of great importance to developing countries like India.

Human survival, let alone economic well-being in the contemporary context of abysmally low levels of available infrastructure for development, in these parts of the globe, may well confound future historians. The chasm between the demand and availability of infrastructural services is already too wide an we have indications that it is increasing rapidly all over the third world. Infrastructure failures in the contemporary terminology merely bring to mind the famous breakdowns of traffic and transportation one hears of in Calcutta or Bombay or Mexico or Sau Paulo or other metropolitan cities, the inhuman living conditions therein and the galloping population in their slums. I wonder why the term 'infrastructure for development' has acquired an urban connotation.

We generally tend to discount the rural segment where the need for infrastructure is equal if not more than the urban segment, at least in the Indian context, where the population is still predominantly rural. It therefore becomes essential to develop a more comprehensive and balanced perspective on infrastructure for development. The policy base of infrastructure rests on assured availability of basic resources and the operational balance between political, social and a host of other elements incumbent in a democratic milieu. Yet, in reality, each of the element tends to take a stranglehold on the development process instead of facilitating and therefore, needs to be analysed comprehensively. Easier said than done! The approach stipulates a concentrated drive to protect, preserve and promote the very resource base which is gradually but rapidly eroding. The operational implications of the challenges are certainly complex, especially in respect of planning, policy formulation and technological forecasting. The challenge again makes it imperative to develop a systematic beneficiary orientation to planning for infrastructure through scientific deliberations and interaction amongst professionals, academics, administrators, scientists, technologists, trainers, policy-makers and most importantly, elected functionaries at various levels of the government. Considering the imperatives of accelerated development, the need of the hour is to improve upon the methodologies and approaches to planning of infrastructure for development, both urban and rural; and evaluation of investment patterns, vis-a-vis the yields there from.

We, in India, are proud of the fact of being the tenth most industrialised country in the world. The exuberance sounds superficial because:
i) We have the spectacle of unmitigated poverty though endowed with large bounties of natural resources;
ii) We have institutional infrastructure equipped with state-of-the-art of technology but not being able to service the social objectives with which they were established; and
iii) Indian economy is said to be stable, enjoying a moderate rate of growth, yet, the 'spread effect' is not uniform throughout every segment of society.

For instance, the status of women in our society. Although there is a considerable appreciation of the role of women in development, one critical issue which has remained largely neglected is the plight of poor women who face the double burden of being poor and being women. Over the past decade, both the movement on amelioration of their plight and national policies have demonstrated greater realisation of the significance of the crucial interlinkages between the gender and equity. In a radical departure from the past, it is being increasingly recognised that poor women have the least access to basic needs, both within the family and outside it. Women often, constitute a deprived group even among the poor, in spite of statutory support in most areas. Literacy rates and wages are found to be lower for women than for men, their access to social service and employment becoming more and more difficult. The plight of the poor women is disturbing in itself. It is even more troubling because of the fact that health and education matters pertaining to women also influence greatly the well-being and future of their children.

The most effective way of achieving rapid and politically sustainable improvements in the quality of life for the poor, whether urban or rural, could be through a two-tiered

strategy; the first being the pursuit of a pattern of growth to ensure productive use of the poor's most abundant asset: labour. The second is a widespread provision of basic social services, especially primary education, primary health care and family planning for the poor. The first provides opportunities and the second increases the capacity of the poor to take advantage of these opportunities. The strategy must be complemented by generous resource transfers to help those notable to benefit from the policies, and by safety nets to protect those exposed to shocks. Thus, any policy on infrastructure for development needs to be critical to the reduction of poverty. Simply increasing resources may not solve the distribution problem. Instead, it needs to be closely linked to administrative commitment to pursue development programmes geared to the reduction of poverty.

Whenever I go to my ancestral village, I always tend to compare the various changes in living conditions registered during the past thirty years, ten years ago and now, the infrastructure then and now. I am convinced that we have really made significant progress during the past few decades in the rural areas. Yet, there are several challenges unresolved and it is true that resource constraints slowed down our endeavours at development to a large extent. There are several other problems also which need very close and immediate attention. I have a queasy feeling that it is not purely the poverty or the lack of resources that explains the low levels of development of infrastructural resources. We need to trigger academic/professional sensitivities to the dynamics of inter-organisational relations in a live situation as against the current trend of simulating typical situations.

Debate on development of infrastructure for low-income communities will always be endless we consider the ways and means to contain the numbers to be serviced by developing infrastructure. For instance, Hyderabad City itself. Those of us who know the City for more than four decades used to consider it as a little more than an over-grown village because of the vast green spaces all over. A nineteenth century historian of Hyderabad City recorded that the City had the widest roads and the traffic was so little that one really could enjoy walking on the roads. How I wish I had lived in the nineteenth century. Conspicuous by absence were the now ubiquitous multi-storied monsters. Now the more disturbing fact is that their numbers are proliferating like the proverbial mushrooms. The city infrastructure intended for a population of a couple of lakhs, is bursting at the seams, what with a population of over 3.8 million to service. The same is the experience in other metropolitan cities too.

At the time of my college days, the City of Delhi, where I studied, had a population of barely half-a-million and today, we talk in terms of ten million-plus. Under such circumstances, infrastructure development, whatever the scale, is not going to be any help. The only alternative would be to learn to contain the population growth. Yes, some of the policy measures and incentives that are made in this direction are certainly yielding positive dividends, but still so much remains to be done in this area.

Now, there is also the question of the emphasis we lay on infrastructure development, vis-a-vis other capital intensive programmes. As far as the investable public funds are concerned, the investment channels as well as patterns become predetermined in tune with the compulsions incumbent in a democratic society. We are constrained to provide higher priority to what is possible to achieve now and for the benefit of present users as against planning for long term results. I am glad to note that the Osmania University befitting its stature among the academic institutions in the state, has come out in a big way to propagate the right approach. As a planner, with whatever expertise I can claim, I strongly feel that the planning objectives have to be focused more on tthe future and also to balance the pattern by inclusion of the infrastructure elements to make the life of the present citizens happy and safe. As part of the long range perspectives, I hope the participants considered the broad range of measures for improving sanitation and waste recycling. For instance, I wonder whether all of you know that we import scrap paper from Australia for manufacture of paper indigenously. Even with the current crunch on foreign exchange, we still import scrap paper. Is it not something which deserves serious attention by the professionals sitting here to evolve effective and affordable methods of recycling the waste paper within the country.

Then the complex issues pertaining to privatisation of infrastructural development also merit serious analysis. Anything given free has no value whatsoever. Perpetuation of a citizen's dependence on subsidies does not really encourage public initiative. Doles are similar to crutches. Perpetual subsidy for development of infrastructure, I personally think, is desirable from a long range point of view. Everything should be planned in the long run towards a self-financing proposition. Maybe, some might be in the short run, some might be in medium term and some might be in the long run. The context endows critical importance to the framework of political and economic institutions because any policy intended to reduce poverty involves a trade off. This trade off is not in the main, between growth and reduction of poverty. It involves switching to an efficient labour intensive pattern of development and investing more in the human capital of the poor. Sustained and accelerated long term growth which means a larger share of public income and spending will go to the poor. The principal trade off on further analysis, especially in the short run, could be between the interests of the poor and those of the non-poor and therefore, policy options favouring the poor are more likely to be adopted in countries where the poor have an opportunity in political and economic decision-making.

In India, during the 50s and 60s, growth was seen primarily as a means of reducing poverty and improving the quality of life. For example, the Planning Commission viewed rapid growth as the main instrument, although not the only one, in achieving economic development. In the 70s, the attention shifted to direct provision of health, nutritional and educational services, which was seen as an important matter for public policy. It was considered that improvements in health, education and nutrition of the poor were important not only in their own right but also to promote growth in incomes of the poor. The 80s witnessed rapid and politically sustainable progress on poverty by pursuing multi-layered strategies calling for action programmes that harness incentives to social and political institutions, infrastructure and technology to that end. The sub-elements of development strategy are viewed as mutually reinforcing where growth in incomes can be sustained at the same time without losing attention on

current level of social services. No task can command a higher priority than that of reducing poverty. It remains a problem of staggering dimensions. Despite the difficulties, the means for reducing poverty are at hand, in most of the developing countries and this is a redeeming fact.

I am sure that this Conference has also discussed another vital problem about energy needs of rural areas. Infrastructure in rural areas entirely depends upon how the rural energy needs are taken care of. I was asking Dr. Lakshmipathy whether the subject of energy was included in the group discussion because if you look ahead for another five years or a decade, you may find adequate scope and prospects for producing more food because of the successful efforts pertaining to the green revolution. Productivity in agriculture is rapidly improving, but we have the bleak prospect of not having affordable fuel to cook the food. Indiscriminate denuding of forest cover, increasing delineation of forest land for agriculture are indicative of inadequate appreciation of energy needs in rural areas. I am sure, we cannot think of infrastructure development whether low-income communities or otherwise, without recognising the energy needs. The agenda for discussion on energy, particularly in tropical countries like India, includes issues relating to use of non-conventional energy sources. At the macro level of planning for efficient use of energy, the analysis gets linked up with fuel consumption patterns, especially the low-income group, because expenditure on account of energy needs, like cooking, lighting, etc., still remains high int he budget of poor and lower middle class segments. If one can really develop a building design to facilitate the use of solar energy, I must say a major problem has been resolved. I have designed a domestic solar water heater for my personal use and I do save substantial amounts on my electricity bills because in our climatic condition at least 300 days in a year, I get hot water which is used not only for bathing but also cooking purposes without having any recurring expenditure. These then, I think are some of the issues that really need attention from a long range point of view.

Prof. Chandrasekhar Rao has rightly pointed that there are certain areas which deserve a greater deal of attention in conceptualisation of infrastructure development. For instance, he mentioned education, and Professor Navaneeth Rao also mentioned the attention that is paid to higher education in this country. In a country where productivity levels have to be substantially improved, this can be done only when the infrastructure in education is improved substantially. Again, the emphasis on both primary education and women's education have to be much greater than what it is today. The results of the investments are bound to be very significant. Perhaps, that is the economic equation which the low-income communities have to apply in evaluating their endeavours. The evaluation can include questions such as, level of utilisation of the investment made in infrastructure, quality of construction of projects and effectiveness of the projects already completed. I am happy to note that this Conference has addressed itself to all the primary elements of an effective strategy for the amelioration of poverty. I have noted the frame for discussion which included analysis of resource bases. I am also glad that the Conference provided ample scope for individual expression and debate in balancing theory with technical visits in order to provide insights into strategy alternatives and policy-formulation, programming and implementation. I have no doubt, that various groups which had visited the low cost community facilities in and around the city (both urban and rural) would have some very valuable recommendations to make in this field. An uncomfortable feeling persists while we talk of shortages which is that we have not yet been able to effectively utilise all the investment that we have made.

I take this opportunity to congratulate the Regional Centre for Urban and Environmental Studies, Osmania University, and the Water, Engineering and Development Centre, Loughborough University of Technology, who have launched the collaborative venture. I am sure, the proceedings of the Conference will be published soon for use by those who need them most.

Thank you very much once again for having given me this opportunity.

16th WEDC Conference

Infrastructure for low-income communities

Hyderabad, India 1990

VALEDICTORY ADDRESS 2

Professor John Pickford

This has been the 16th WEDC Conference. All sixteen Conferences have differed; all have been good, but in different ways. This 16th Conference has been particularly memorable in three ways.

Firstly, the Hyderabad Conference has been outstanding because of the wonderful partnership between the Regional Centre for Urban and Environmental Studies here and the Water, Engineering and Development Centre. Professor Ravindra Prasad and Dr V Lakshmipathy have made fantastic efforts to ensure that all the arrangements have been of the highest possible standard. They have been fully supported by every member of the RCUES staff, who have worked day and night for us.

Secondly, the participants have ensured the success of the Conference by their attendance, by their experience shared with others and by their contributions to all the sessions. We have been encouraged by the attendance of 51 participants from outside India and by the range of countries they represent. Especially valuable has been the presence of so many ladies, who have taken a notable part in the proceedings. Thirteen of the forty or so papers have had women as authors or co-authors. This is exceptional for International Conferences of this sort, which often have an overwhelming preponderance of males.

Many of the participants are old friends. Some have been to Loughborough for our courses; some have attended previous WEDC Conferences; others we have met during working visits to India, Bangladesh, Nepal, Pakistan and Sri Lanka. It has been wonderful to renew all these old friendships again.

The third special feature of this 16th Conference has been the wide range of topics covered - all dealing in some way with infrastructure for low-income communities. We have talked about development of women's skills, with soil blocks for low-cost housing, with sites and services schemes, with labour-intensive road construction, and with many aspects of rural and urban water supply and sanitation.

With all these topics there are similar concerns. The technology should be appropriate, communities should participate, costs should be recovered, institutions built up and attention should be given to operaton and maintenance, to sustainability, to replicability and to the latest jargon-word "enablement" enabling communities to manage their own infrastructure.

During this week we have discussed much, and we have all learned a great deal. The interaction between engineers and social scientists has been particularly valuable. We all tend to put our individual professions on a pedestal, expecting others to look up to us. It is good to become aware of what others really think of us.

I spoke earlier about our delight at meeting old friends again. Now, after a week together, we have many new friends. My first introduction to India as a young boy was through reading "Kim" by Rudyard Kipling. Kim was known as "the friend of all the world". In WEDC we think of ourselves as friends of all the low-income world. We look forward to the friendships developed here continuing for many years in the future.

Water, Engineering and Development Centre

The Water, Engineering and Development Centre (WEDC) is concerned with training, research, consultancy and other activities related to the planning, provision, operation and maintenance of water supplies, sanitation and other aspects of infrastructure in developing countries.

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