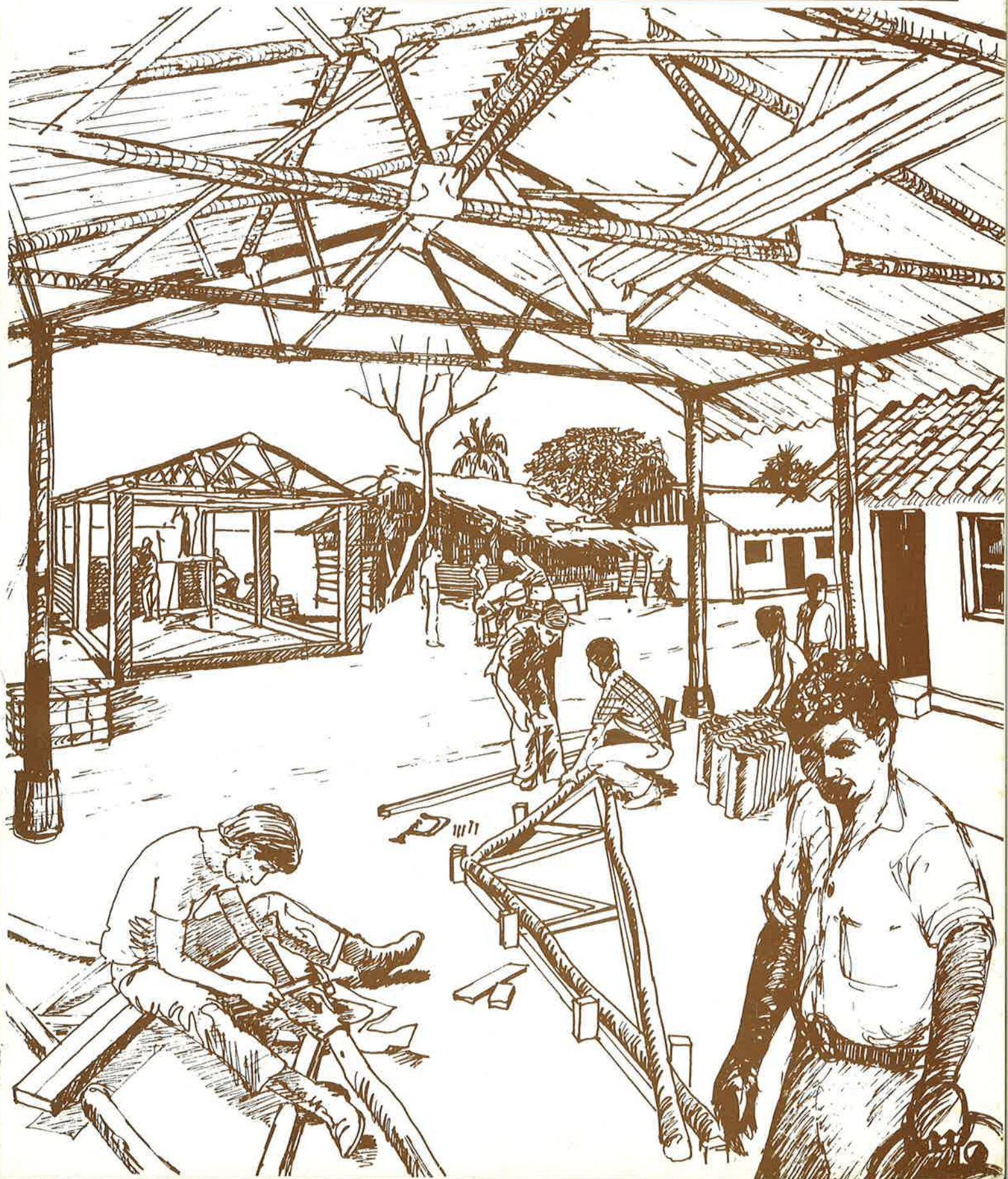

Shanty Upgrading

Technical handbook for upgrading squatter and shanty settlements.



Shanty Upgrading

A technical handbook covering the background and issues relating to shanty upgrading and appropriate techniques for construction and the production of building materials

Edited by
John Parry and
Andrew Gordon

Manual prepared for the
Overseas Development
Administration by
J.P.M. Parry and Associates
as a contribution to the
International Year of Shelter
for the Homeless

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Abstract

This technical handbook is one of a series commissioned by the Overseas Development Administration, which began with the publication in 1983 of the Urban Projects Manual (ed. Forbes Davidson and Geoff Payne - Liverpool University Press).

This book provides further background on the approach to upgrading projects, especially on administrative and legal aspects, and then deals extensively with techniques - for building, the production of building materials and infrastructure - which are particularly appropriate to low-cost, self-help building and shanty upgrading. The techniques described, some of which are relatively new, are based on the field experience of the contributors in many parts of the developing world. The book is concluded with four case histories drawn from practitioners' reports.

Overseas Development
Administration, London

Shanty Upgrading

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Andrew Gordon
(editors)

J.P.M. Parry and Associates
(consultants)

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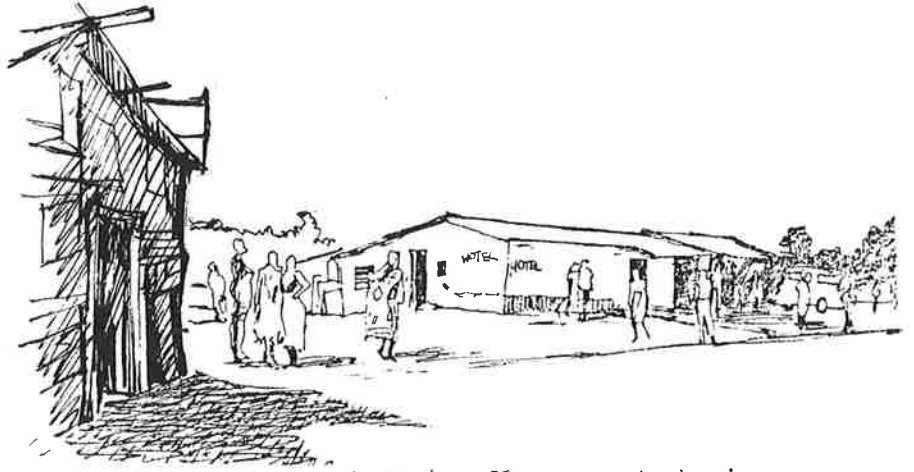
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Foreword

Put yourself in the position of having travelled many miles from a country district and desperately needing to find a place to stay within reasonable travel distance of a factory where you think you can get a job. With meagre savings to call on there is no question of buying property. Even the smallest house or flat might cost many years' income and, without security, no lending institution will offer you a mortgage. Anyway, how permanent is the new job likely to be?

You may be without family or friends in the neighbourhood and it will be necessary to obtain temporary lodgings. In the worst squalor of most shanty towns all of the normal accommodation alternatives can usually be found, ranging from 'Hotels' to short term lodgings. After all, shanty towns are dormitories for wage earners.

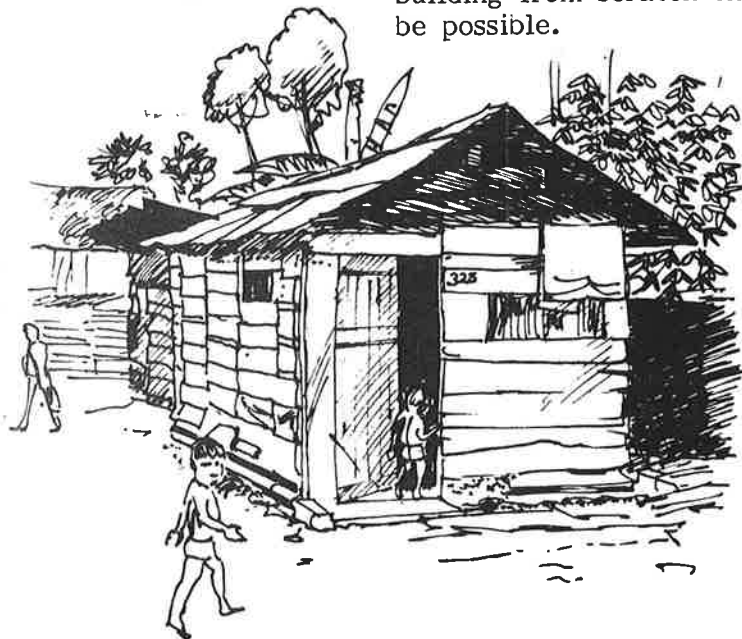


Who do these belong to? You are told that the ownership of a surprising number of the tin roof, mud wall lodging houses actually leads back to a school teacher, civil servant or politician - sometimes people of high rank: 'It's my pension you see ...'. So there should be somewhere to stay but it could be expensive and eat into the wages you hope to earn. The houses around are pretty ramshackle and worse if anything than those back home in the rural area. So building from scratch should be possible.

However, to begin construction of a new dwelling is unlikely to be possible for quite a long time after you have arrived. Until you know the ropes - the power groups, gangs, community associations, 'party' organisations and extent of official interference from the local police you can never risk picking out a patch of land and starting to build a shack yourself.

Security and safety are a major preoccupation. Crime is very common. There are no streetlights at night and the crowds are full of anonymous faces. Whatever happens, your precious belongings and the wages you might earn must be locked away and you must be able to sleep in reasonable safety. Fortunately many of the people around you are in a similar position to yourself some even from the same tribe so it should be possible to make friendships and pacts to help each other.

A few months later, the job seems quite secure and in spite of the high rent on the small room it has been



possible to gather up some savings and it would be far better to bring your family to town. There is even a possibility of casual work for your wife and older children. As for finding space to build and get together materials, the shanty settlement itself turns out to be a huge market place where most materials and services can be obtained. A complete house can be put up at an amazing speed - it has to be - you can't risk leaving materials loose in an unenclosed structure. Maybe now is the time to have a go at putting up a place which, once built, means no more rent other than a little protection money to the local gang and the police.

But there is a complication: people keep talking about an 'upgrading scheme'. A succession of educated-looking people keep coming round asking questions, taking photographs and measuring roadways and houses. What is going on? What is in it for you? Are there going to be any free handouts and improvements such as water supply, sanitation, schools, even electricity? What are the snags once the area is 'improved'. Will it just mean paying rent again or even being made to move away so better-off people can come to live in the locality which is so conveniently close to the factory? Most of all - why are they doing it?

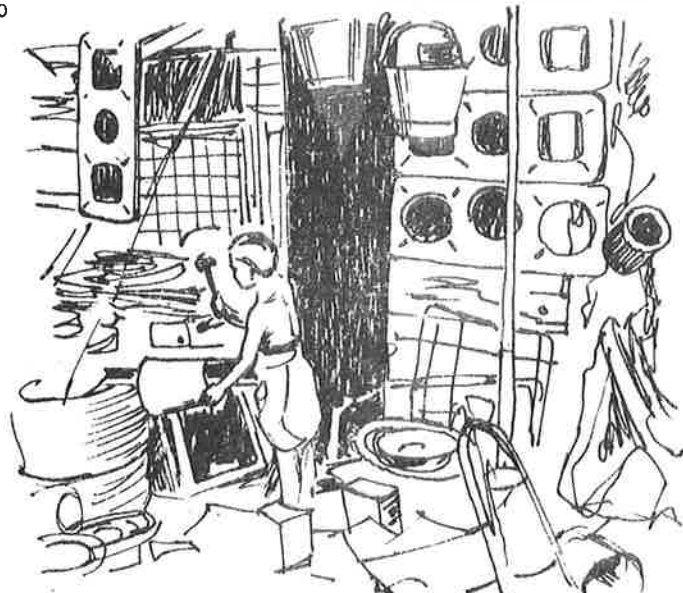
Better reserve judgement, get together with others around you to gather some political weight in case of trouble and

don't miss any good opportunities to get a better situation.

* * * * *

Not many shanty dwellers will ever read this book but unless it covers issues directly relevant to them it will be so much printed paper and of no further consequence. The greatest mistake would be to take a detached attitude. At one extreme there is the sentimental view, of certain charity workers perhaps, which takes pity on the squalor, the poverty and the harsh circumstances, but misses the point that urban shanties are often the epitome of raw economic activity: people fighting furiously to hold on to their first rung on the employment ladder; micro-businessmen trading, catering, constructing, producing for the needs of the rest of the settlement and outside.

Youthful bucket maker,
Colombo



At the other extreme, from the relative tranquility of a middle class suburb, the shanty settlement might look like a hot bed of criminality and social vices. Based as it is on the illegal occupation of land, what else could you expect? Again this view misses the point. Within the community itself there is eventual stability and rule of law of a sort. If the surrounding formal community appears hell bent on their extinction, it is not surprising that some of the shanty settlers view the same community's possessions as 'fair game'. Just as the 18th and 19th century European seafarers were robbers in other peoples' countries but noblemen in their own, so the shanty's most talented thieves may be heroes and benefactors in their own community.

One of the most significant contributions people concerned with upgrading shanty settlements can make is to find ways of converting illegal enterprise into GNP and land seizure into

legitimate investment. Once heads of families begin to think long term, instead of living by their wits, the social investment follows.

When contemplating the growing urbanisation worldwide and the inevitable spread of informal settlements on vacant land, it is too easy to see the wood rather than the trees. Viewed as a whole, the problem (it is universally thought of as a 'problem') is overwhelming. A shanty settler is thought of as a kind of refugee from the countryside where population growth and mechanisation are cutting back rural livelihoods. However, there would be no point in writing if it were not possible to take a more positive stance. At the time of the Industrial Revolution in Britain were there not parallels with the present day Third World? Are not many of the shanty dwellers pioneers and pathfinders?

Less than two miles from the office where this book was produced (at Cradley Heath in the industrial West Midlands of Britain), is the township



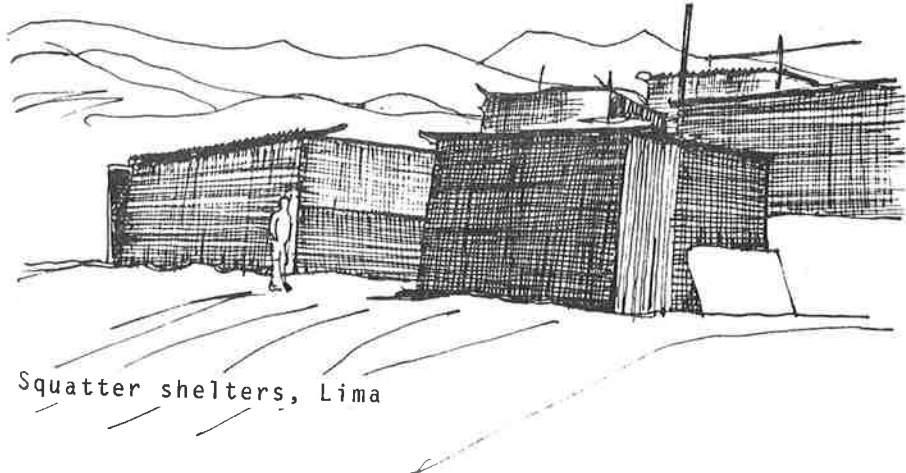
of Lye. Only 150 years ago Lye was nicknamed 'Mud City' because of the hundreds of informally constructed mud dwellings and earth roads in the huge settlement of informal shacks built by rural people from Wales and Herefordshire, who flooded into this area to take jobs in the chainmaking and nailmaking workshops of Halesowen and Cradley Heath. "Mud City" has long gone, roads are paved and houses

have been built of bricks and tiles since the settlement became permanent in the early 20th Century.

What do we need to do (or should we do anything) to accelerate the process by which the shanty towns of the Third World can evolve into orderly healthy settlements?

Do we perhaps see the first signs of a returning malaise in the UK as the jobless in certain parts of the country find the cost of housing in the more prosperous South East an impossible barrier to legal settlement for the worker and his family near the sources of work? The little huddles of caravans on lay-bys and waste land with washing hanging between the trees indicate the pressures which may be leading to a new era of shanty settlements in Britain?

In 1987 the International Year of Shelter for the Homeless, the problem of creating accommodation which is healthy, congenial and economically sensible is worldwide. By asking some of the most experienced workers in the field to outline their ideas on technical, financial, planning and social solutions to this huge problem, we hope to give other workers a practical handbook with a few fresh insights and a briefing as to how methods which have succeeded in a few projects can be applied more generally.



Squatter shelters, Lima

Chapter 1

Introduction

Over the last quarter century cities throughout the developing world have seen an extraordinary increase in their population. Migration from rural areas and natural increase enhanced by modern medicine have led to expansion on a scale which dwarfs the urban migrations of the past 100 years in industrialising Europe. At the same time disappointing economic opportunities have generally resulted in a huge increase in the proportion of city-dwellers who are very poor.

The consequent demand for shelter on an unprecedented scale has bewildered city authorities and governments. At first the solution was seen in the current European practice of state provision of decent low-cost housing at affordable rents but it soon became clear that to solve the problem in this way was far beyond the financial, physical and organisational capacity of governments, however amplified by aid. With limited capital available planning authorities also had doubts about the productivity of investment in urban housing and debated whether money might be better spent on some of the perceived causes of migration in the rural areas. These doubts together with the sheer impossibility of solving the problem with imaginable resources tended to leave governments irresolute.

All this time, however, the great majority of the urban poor were somehow succeeding in housing themselves. They may have been building on land where they had no



rights, with dubious materials assembled to no recognized design and huddled on land with no provision for basic communal services such as water and drains, but in numbers no law could resist they were succeeding in providing for themselves the shelter they could afford. The spontaneous energy of families building their own homes and the material resources they devote to them once they begin to feel secure ('at home') were assets which state planners had completely overlooked and it gradually came to be realised that the solution to the problem of shelter must lie in harnessing these capacities.

This insight led to a completely new approach to housing for the poor and a deep change in the relative positions of the parties concerned. If people were

reasonably sure of their rights and knew what resources were to be available, they themselves would be best placed to judge what sort of housing suited them, what services they could afford and what they could do for themselves. The role of government would be limited to ensuring that, for those willing to devote their own effort and resources to housing themselves, the required facilities and services were available: provision of land title, infrastructure, credit institutions, technical advice and, most importantly, co-ordination and encouragement. Some of these facilities could be provided free of charge, some repaid through rents or taxation and some paid at the outset as a capital charge, borrowed if necessary from a credit institution against future income. As long as adequate

reasonably-placed land could be found this formula provided for a wide range of possibilities for allocating the burden between householders and the state. For governments, the result may not be the city they had planned but at least the huge problem of shelter now looked manageable for the first time.

As the new approach was put into practice, however, it was soon apparent that there was a great deal to learn. Implementation of the policy demanded new skills and new attitudes, some of which were not immediately recognized as needed and some not readily available in the construction industry or the housing departments of governments. Real community participation in decision-making, based on data and advice that people can understand, is difficult to arrange and requires diplomatic, political, financial and negotiating ability as well as technical knowledge. And community participation is not just politically trendy - it is an essential condition for the sense of commitment which is needed to sustain a self-help community, especially after the completion of the upgrading project itself and the departure of the implementing agency.

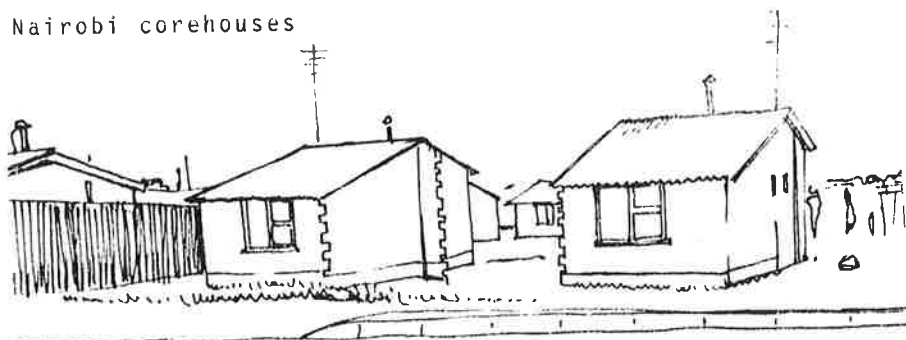
Self-help housing now takes two distinct forms: site-and-service schemes and settlement upgrading. In the former the government provides a clean site with basic infrastructure, demarcated plots and often a cooking and sanitary 'core' on each plot, it being left

to the plotters to complete the houses themselves. The upgrading of an informal settlement involves rationalising plot boundaries, putting plots on to a regular legal footing, providing essential and affordable infrastructure and slowly improving standards with relatively little disturbance to the community. This book is mainly addressed to settlement upgrading, but the building techniques we discuss and many of the problems of upgrading are common to both types of scheme. Conversely much of the practical experience of site-and-service schemes is relevant to upgrading which is why some site-and-service schemes are included in the case histories at the end of the book.

Although the concept of combining self-help with relatively light but articulate government assistance has been practised for more than 20 years and the technique is now very widely spread, it has been slow to acquire the norms and standard procedures which ought to make it easily transferable. Things often go wrong, as our case histories show. However,

although some failures have been due to particular country circumstances and the system has in any case to be somewhat tailored to local social and economic conditions, analysis of the experience so far has revealed some common deficiencies and shown where improvements in the system are most needed. For example, housing credit policy probably needs to escape from the traditional mortgage mould and to develop a specialised service for low-income and self-help building. Systems of tenure devised for informal settlements, often to 'protect' the newly enfranchised plotholder from the market, need to be assessed for their success in provoking full commitment of private resources to the home. Most importantly, community participation in upgrading is often sacrificed for the sake of quicker results and it becomes clearer every day that this is a major mistake: the sense of neighbourhood commitment and responsibility towards such matters as the payment of dues and maintenance of common facilities is crucial to the success of an upgraded

Nairobi corehouses



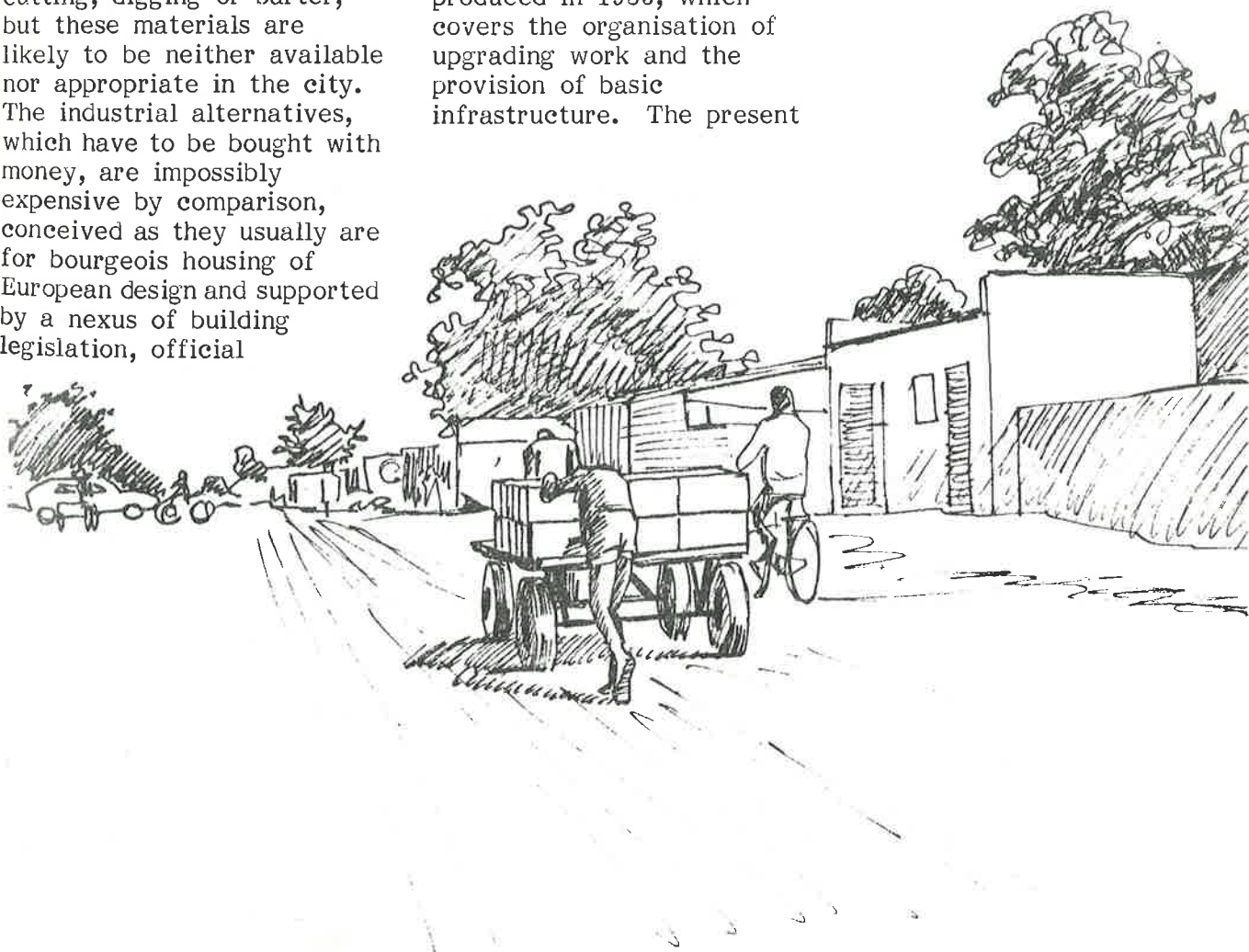
settlement. The art of mobilising community participation and cultivating the right social climate is still being developed, successful practitioners are few and the critical factors in their technique anxiously studied.

Probably the largest area of plain deficiency, however, is in building skills and techniques appropriate to the construction of houses on the precarious margin of affordability. Those from rural areas will have brought skills in traditional building materials which could be acquired locally by cutting, digging or barter, but these materials are likely to be neither available nor appropriate in the city. The industrial alternatives, which have to be bought with money, are impossibly expensive by comparison, conceived as they usually are for bourgeois housing of European design and supported by a nexus of building legislation, official

standards, mortgage lending conditions and established commercial interests. There is a very urgent requirement for building techniques and materials which fill the gap between these alternatives and provide serviceable, low cost components and construction methods which give adequate comfort and security and are fully acceptable to builders, homeowners and even to mortgage lenders.

This book is principally concerned with this last need. It is intended to be complementary to the ODA's Urban Projects Manual, produced in 1983, which covers the organisation of upgrading work and the provision of basic infrastructure. The present

book describes the kind of administrative and economic framework an implementing agency needs to try to organise when embarking on an upgrading project and then concentrates on the technical means - construction methods and the production of building materials - which are available to individuals attempting to improve their housing conditions at the lowest possible cost.



Chapter 2

The Problems and the Issues

The Urban Magnet

The 'urban magnet' both attracts and repels. People seek the excitement and opportunities of town life but at the same time are deterred by the practical difficulties of finding somewhere to live and somewhere not too far away where they can earn a livelihood.

People migrating from the rural areas are generally seeking opportunities for increased income which do not exist in the rural areas. They will range in status from the almost destitute landless labourer, for whom only the small chance of a town job is more attractive than prospects in the village, to the sons or daughters of fairly prosperous farmers who simply prefer the idea of city life to working and living on the family farm.

A few quickly find reasonably well-paid jobs - probably those already better off, with good connections or possessing a readily marketable skill, such as a carpenter or blacksmith. A much larger number find themselves working 'informally', scratching together small sums of money by shining shoes, selling trinkets or begging. Many of these will soon be even more destitute than when they started, not even having the cash to make the (probably ignominious) journey back to

the less squalid conditions of the rural areas. The shanty dweller's move to town will usually have been irrevocable. He will have been hoping to be making an important upward step for himself and his family. However, if his living conditions turn out to be worse, his wealth diminished rather than increased, educational opportunities no better than in the village and the chances of being the victim of crime very much greater, then the step will be definitely downward. In his own and his friends' eyes he will be no better off than a rural peasant. Yet pride, if nothing else, will prevent him absolutely from considering any return to the rural life.

The other interested parties

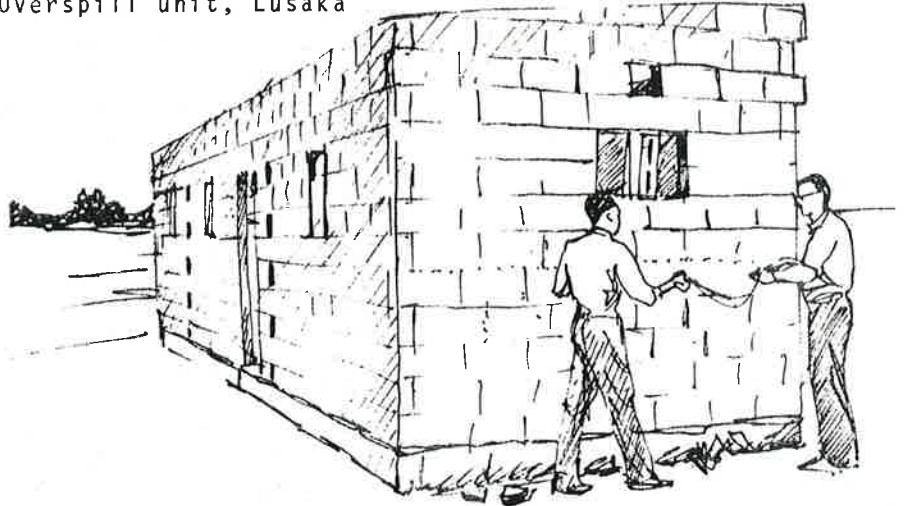
From the viewpoint of the larger city community, the growth of a reservoir of poor, disillusioned, uprooted people with nothing much to lose is far from welcome. And even if the shanty dwellers are not poor, their settlement and their homes will probably have no official recognition - they may even be officially classified as 'illegal' - and it will not be surprising if they had rather less respect for the law in general than the formal owners and renters who enjoy its full protection. While citizens of goodwill may be anxious for the shanty dwellers to become fully absorbed into the economic life of the town, there will be many who



bear a mix of different sorts of resentment towards them. Some will see the shanty as a haven for criminals, some will fear competition from the immigrants for jobs, some will blame the migration which caused the shanty on policies of the government, whose responsibility it should be to reverse it, while some will strongly object to the precedent of legalising the squatters' occupation of land. A few may even suffer tangible loss on being dispossessed of land illegally occupied.

From the viewpoint of the state, action to control or remove the shanty when it is small is difficult, due to cost and the absence of practical alternatives: when the shanty has become large, it is politically and economically impossible. In the end the authorities have to accept the new settlement as a *fait accompli* and positively decide to make the best of it. This means absorbing the shanty population into the fold both politically and economically, regularising their occupation so as to encourage attitudes appreciative of the law rather than resistant to it, turning them from disaffection to support of the government, and encouraging permanent building and economic activity so as to transform them from consumers to producers of state revenue. The task is far from straightforward and is vulnerable to political interference. Substantial expenditure is required, although this does not

Overspill unit, Lusaka



guarantee success, and equity has to be preserved opposite other groups in the community.

Upgrade or start afresh

Having decided to take action to improve the circumstances of a shanty community one of the first things that the authorities have to consider is whether to operate on the existing settlement or to start afresh on a completely new site. Starting on a new site, eg with a site-and-service scheme, has all the advantages of tidiness and efficiency that administrators and technical experts love and it avoids the controversial problem of legitimising squats: on the other hand it is deeply disruptive of the community, which is a material though unquantifiable cost, and it probably takes no account of the need or logic underlying the location of the existing settlement. Site-and-service schemes have been known to fail because the people concerned simply did not want to live there.

At the same time it must be said that the site of a shanty settlement is often extremely unsuitable, its unsuitability being the reason for its availability, and may require expenditure on capital works, such as drainage canals, which could be much more effectively spent on a new site. For example a technically good semi-rural site could be chosen and connected to the city very cheaply with a low-technology light railway.

The adjustment of boundaries in an upgrading scheme nearly always displaces some families, who will probably have to move to a site-and-service scheme, and there are usually some residents who prefer this course. Moving to a new site normally involves a family in a greater initial money commitment than does upgrading, which means that upgrading is accessible to lower income groups than site-and-service schemes. The two types of scheme are thus to some extent complementary.

However, governments and implementing agencies are increasingly in favour of retaining existing communities if possible, even if the costs of upgrading are slightly more. The sense of community identity and purpose, which can be very strong in a shanty, especially if occupation rights have had to be fought for, can be extremely valuable in an upgrading scheme and an important factor for the scheme's success.

Public and private resources

Whatever the degree of self-help, upgrading needs capital. Even if the skills and labour of every member of the settlement to be upgraded could be harnessed for the benefit of the project, many inputs would still need to be purchased, eg basic building materials such as cement, infrastructure equipment such as pipes and pumps, electricity distribution equipment, tools of every kind etc. In practice a substantial amount of liquidity has to be introduced in the form of housing loans to individuals, communal loans for infrastructure, business loans for enterprises serving the project (eg production of building materials) or for other economic activity generating incomes from which to service loans and so on. A decision has to be made at the outset of an upgrading project as to how the capital funds available should be allocated between these heads of expenditure.

Government funds for upgrading purposes, whether or not originating in international aid, will be very limited and will normally be expected to revolve, i.e. be repaid according to a plan so as to be available for further loans or development either in the same upgrading project or another. Housing and business loans will be repaid by monthly payments to the lending bank; infrastructure loans will be repaid through property taxes or rents. To maintain an effective system of cost recovery is not easy and depends partly on public attitudes to the administration as a whole. The secret lies in good design of the total project. Building projects, both private and communal, must not be over ambitious; loan and tax/rent responsibilities must be affordable by those who take them on; and the system of collection and enforcement must hold the general respect of residents.

If the state expects to recover the initial capital it contributes to an upgrading scheme, it follows that individual residents who take part in the scheme must be prepared to devote their own resources to the building of their homes and the laying of the communal infrastructure. Indeed the success of an upgrading scheme is absolutely dependent on the willingness of people to commit their savings in this way over a long period. The homebuilding drive in most people, especially parents of young families, is strong but the degree to which they will be prepared to turn their assets into housing depends on the realisation of a number of conditions. It is the art of the implementing agency to identify these conditions - which will trigger the maximum effort by residents - and bring them about.



Shanty dwelling, Lusaka

Ingredients of the formula

Is there a formula of conditions which will reliably galvanise shanty dwellers into transforming their community?

Practitioners of shanty upgrading have held numerous conferences about this and, although the formula with guaranteed results has not yet been devised, the main constituents for success are beginning to emerge. Some of these have side-effects, however, which, although more important in some cultures than in others, tend to keep the debate open.

The shanty resident needs to feel from the outset that there is an achievable goal, in terms of housing and environment, which he can secure at a cost which he can afford. This is perhaps the core condition which governs the rest. The generally agreed strategy is, first, to assure the resident of reasonable security of tenure; secondly, to provide a route to decent housing at the lowest possible cost, matching required payments to what the resident can afford; and thirdly, to place the responsibility for development of the settlement as far as possible with the community itself by involving them in all deliberations and decisions.

What people can afford can be improved by:

- measures to reduce building costs, eg by introducing appropriate technologies which require less industrial inputs and more of the effort and



Kigali brickmakers

skills which can be made available from within the community;

- measures to enhance incomes, eg by stimulating enterprises, especially those which can serve the project, such as the production of bricks, blocks, roof tiles etc;
- the provision of 'compliant' credit, eg housing loans which, although not necessarily subsidised, have conditions and repayment schedules which take particular account of small and/or irregular incomes and unconventional housing.

The strategy involves a number of compromises which, to varying degrees, provoke legitimate queries from

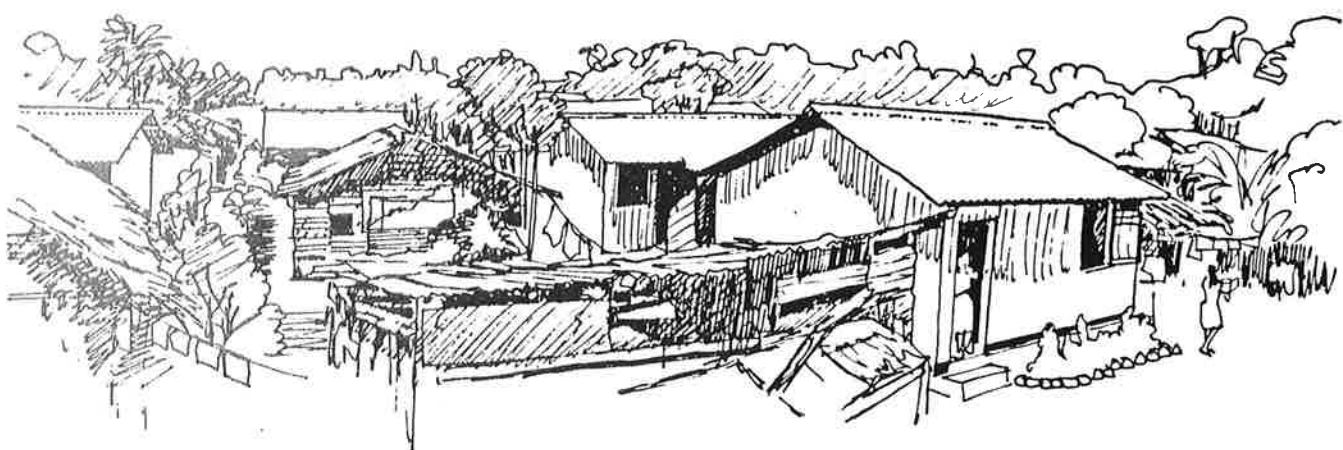
governments, politicians, professionals and others. For example, the resident's title to his plot should, if he is to spend money on his house, be freely marketable, but this conflicts with some



systems of tenure and allows the 'benefits' to fall into the hands of 'non-target groups', to which some people object. Alternative building technologies usually require the easing of existing building standards: these are established for safety and to protect customers and relaxation may be resisted by government departments, professionals and commercial interests. Compliant credit is seen by some as verging on the irresponsible (sometimes with good reason if not well

managed) and thus in conflict with the principle of cost recovery. While community participation causes delay and can increase costs, it also brings many benefits which are more lasting: however, not everybody thinks the investment worth while. These are among the issues which will be dealt with in later chapters. The approach of the authors, however, is that by far the most important practical need at present to close the gap between acceptable housing

and what people can afford is self-help technology. With simple but well-designed processes and equipment and good operator training and management these 'human-scale' technologies can provide standards of design, performance and finish which are comparable with conventional technologies, deliver at a fraction of the cost and mobilise community spirit by involving residents to the greatest possible extent in the finished result.



New houses interspersed among the original shanty shacks, Colombo upgrading project

Chapter 6

Technical Means: Infrastructure

Preparing to build

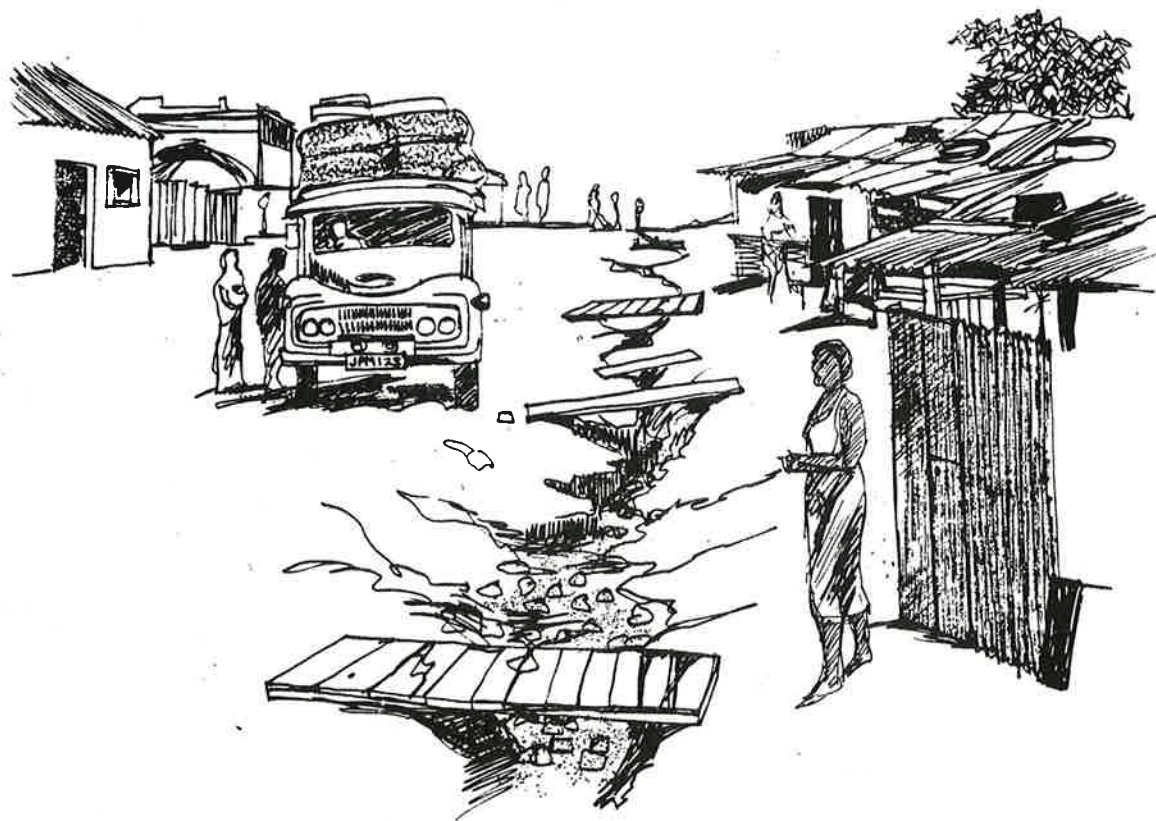
After a few months have gone by you might imagine your position as a newly arrived shanty dweller to have stabilised. You have found a room to rent and a job, although this was at some distance which meant a very early start in the morning. You had some help from relatives and people in the settlement from your own part of the country and a loan from a money lender to pay your first rent. Through the grapevine you might hear the news in very good time that a neighbour who worked in government had been promoted to a job which carried a house and manage to persuade them to allow you to take over the dwelling house he used. Houses in the settlement never stay empty and so you arrange that your wife and children should move

in on the day the others move out. You are no longer the visitor from the country trying his luck, but a full member of your new community with all the responsibilities of a householder and head of his

'House' is perhaps a rather dignified word for the new home. Like most of the dwellings in the settlement it is a temporary affair - appropriate to the conditions some years before when government officials kept coming round telling people they had no business to be there and would soon have to move. This no longer happens but it is still an uneasy life. An aggressive neighbour, born in the town and contemptuous of new arrivals from the country, builds an extra room into space which you feel sure had previously 'belonged' to your

house. There's not much you can do about it.

Imagine that the job is going quite well and you would like to have spent some money improving the house, for both comfort and security, but can you be sure that you wouldn't be forced to take it all down and move? Although the settlement was technically illegal everyone now knows that it would be impossible for the government to clear the whole area, particularly as the local community has formed an active branch of the ruling party in government. Indeed there are rumours of an 'improvement' scheme which could result in each occupier becoming the recognized owner of his plot. This would put an end to the tedious argument and negotiation with neighbours and you would have no hesitation in building proper



walls and a roof if these became assets which you could eventually sell.

Presumably the scheme would also mean proper roads, water supply and even electricity which would bring many benefits including the alleviation of the constant anxiety about fire spreading from oil lamps or from the dangerous amateur attempts at wiring with which some of the stallholders have provided themselves with free electricity from the nearby mains. However roads take up space and with the straightening out of plots it looks inevitably that some people will have to move. Those who stay will presumably have to pay for the new services through rates or taxes, since it is known that the government has no money to give away. Some of the women envisage showers and flushing toilets in every house, but plenty of water means big drains and sewers. Will the rates be more than you can afford? Can you find



Stone lined pit near Beni Sueff

out what the resulting cost will be of any particular service? Will you have any say in what should be provided, how it should be paid for and what services look simply too expensive? 'Consultation' and 'participation' have been mentioned but others say this is just pious talk and means you still get what 'they' think is good for you but two years later by which time the cost has doubled. The future is really as uncertain as ever.

Think early about infrastructure

Infrastructure is the physical framework within which the upgrading of people's dwellings and other buildings in a settlement takes place. It includes roads, water supply, the evacuation of storm water, household waste water and sewage, rubbish disposal and electric power supply. It may also include more or less substantial ground preparation works. Naturally decisions on infrastructure have to be taken at a very early stage in an upgrading project. It is true that most old cities and towns grew and took their particular shape and character with little forethought to infrastructure but the problems - such as inadequate roads or sewage arrangements - had to be faced in the end and, of course, the longer they were left the more difficult and painful the solution.

Changes in the infrastructure of a town tend to be radical

measures, involving inconvenience and damage to many people. The initial costs are high and the gains too long term to interest politicians who need to seek re-election. The result is that in long-established communities it often needs plague, war, tyranny or environmental collapse of some kind before concerted action is possible. Even then the scope may be limited by cherished buildings, churches, national monuments, railways etc, so that the efficiency of new arrangements will be less than it might have been and the costs to the resident population correspondingly more. Lucky the people who can plan their infrastructure, execute the basics and provide for future development before too much cherished building or irrevocable development has taken place.



A community decision

The inhabitants of informal settlements are thus in a better position than many when it comes to designing infrastructure: a new community has come into being and begun to develop its unique character but still has the opportunity to alter its physical framework and ensure that it is right for its present and expected future needs. Of course this is more easily said than done. To decide exactly what to do about roads and drains etc is still a serious community problem. For example, there is an early cluster of interdependent decisions which have to be taken concerning the size of residential plots, the layout of roads and their dimensions, communal buildings, open spaces and the total number of plots in the project area. Roads consume a lot of space: the more road the fewer plots of a given size and a smaller number of households to share the total cost. Plots do not need road frontage but they must be near enough for fire engines and rubbish collection and road proximity will be highly valued by those owning or hoping to own cars. Plot numbers can be increased by reducing the size of plot, but for some it may be unthinkable to live without a patch to grow their traditional food crop. There will be differing views on these matters not only within the community by also from the technical experts and from the city planners, who will be moved by widely different opinions, visions, pressures.

Communities have different ways of achieving consensus on such questions. Some create elaborate and sophisticated committee structures, some rely on the authority of established leaders, some use the political party organisation, some will listen to engineers in preference to politicians and some vice versa. What is important is that a true consensus be reached: that those taking the decisions should have the support of the community and that all those contributing to decisions are as fully briefed as possible on the technical, financial and other issues. The plan, after all, is ultimately 'bought' by the community, which enjoys the services and shares the costs. Payment, which comes later through

rent or rates, can often be difficult to collect if the payer feels alienated from the original purchase decision.

It is the task of the project agency to ensure that decisions on infrastructure are taken in a way which is as far as possible acceptable to the resident community as a whole. For each section of infrastructure there are likely to be several solutions, each with its own implications for other parts of the plan, for individuals, for finance etc. The agency must assemble the data (carrying out surveys where necessary), present it intelligibly, ensure the implications are understood, co-ordinate the debate and discreetly advance it to a conclusion within the terms

Hand built surface drain,
Colombo



of local practice. This is, perhaps, the most difficult and delicate of the agency's tasks and the most demanding on the personal qualities of its leadership.

Appropriate infrastructure

The infrastructure programme must, of course, be affordable by the residents. Most governments will want to see the initial cost plus interest recovered through rents or taxation in about a decade. Provision also has to be made for the cost of maintenance. Some governments or donors may subsidise the initial capital or the interest rate, in which case the amount to be afforded by the residents will be less, but this will also mean that less will be available for other housing schemes. The residents of upgrading schemes are meant to be fully contributing members of the community and in principle they should only buy what they can pay for.

For this reason engineers will offer various options for what they call 'levels of service'. A basic or 'primary' service level will provide for earth roads, improved wells, open unlined drains, communal pit latrines and so on. 'Intermediate' levels will provide for a variety of choices such as gravel roads and communal standpipes, while the envisaged 'ultimate' level will provide every convenience, such as running water and flush toilets in each house, street lighting, tarred roads, lined and covered drains.

Those considering infrastructure options need to keep the following principles firmly in mind throughout the discussion:

1. Service levels must be appropriate.

The options chosen must be suitable for the site and for the customary lifestyle of the residents, they must meet minimum standards of health and hygiene and the costs, including maintenance, must be such that the residents are both able and willing to pay for. City planners and some of the residents may have more ambitious plans but they should be prepared to compromise, at least for the first stage.

2. They must be co-ordinated.

The drainage system must match the water supply, for example. If the water supply overwhelms the drains there will be obvious inconvenience but if the capacity of either greatly exceeds the other there will have been wasted investment resulting in unnecessary cost to the residents. The point may seem obvious but courage is sometimes needed to resist the pet project of a forceful engineer.

3. They must allow for later upgrading.

Whatever the level of service chosen, each element should be constructed as far as possible for later upgrading to a higher level (assuming an increase in income levels or at least in readiness to spend). This could mean



making some of the 'upgraded' investment in the first stage, eg laying larger diameter pipes than necessary or reserving space for a further access road, and might require sophisticated evaluation.

Ground preparation

Much informal urban settlement is on low lying marshy ground which is prone to flooding. This marginal land is usually the only land unoccupied. There are three aims of ground preparation:

- to provide buildable land
- to prevent inundation by flood water from surrounding areas
- to enable storm water to drain easily from the site

If the ground is soft, marshy and low lying, the land must be filled using material imported on to the site in order to raise the overall ground level. This will provide buildable land and reduce flooding by inundation from surrounding areas. The fill must be placed to predetermined contours to enable stormwater resulting from

intense rainfall to drain rapidly off the site.

If the ground is firm but prone to inundation, other options are:

- to drain the site to a sump and then pump out to a canal.
- to build houses on high foundations or stilts

Drainage

The efficient removal of storm water is essential to prevent deterioration of the site and rapid collapse of the road system. There are two important contributory factors:

- ground contours to facilitate drainage by gravity flow
- a suitable network of road and plot drains

The contouring of the site is fixed during the ground preparation stage. The existence of ground slopes allows positive drainage. A flat site is impossible to drain satisfactorily because pools of water can form and it may take a considerable time for storm water to be carried off the site,

Open channel drains are easier to construct and maintain than buried pipelines but they take up more space. The options are:

- unlined open channel drains
- lined open channel drains

The issue is whether the drains should be unlined, i.e. simple earth trenches, or lined with masonry or concrete. Lined drains can cost ten times as much to construct as unlined drains but maintenance of unlined drains is more complicated and may require periodic reinstatement of the line and invert level.

Considerable quantities of water may be used for clothes washing and personal bathing and this generates wastewater which is known as sullage. Although in itself sullage does not constitute a health hazard, if no suitable arrangements for its disposal are made problems will arise. The site will become muddy and dirty and insect breeding will become rife.

If a full piped sewerage system is installed on the site sullage can be disposed of into the sewers. Otherwise the storm water drains must be used.

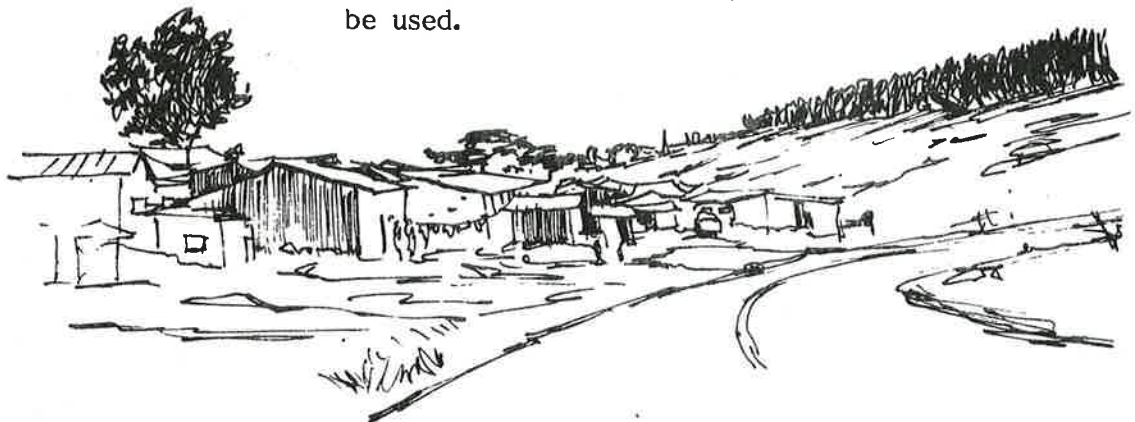
Roads

Road construction offers three main options: the carrying capacity of a road (the number of vehicles per day and their weights) increases through the sequence:

- simple profiled earth road
- gravel surfaced road
- Macadam surface bound with water or asphalt

The construction costs of gravel roads are about twice as much as earth roads, and asphalt-bound macadam costs over four times as much as gravel roads.

Roads devour space and thus displace potential ratepayers. A primary service-level scheme should make do with as little road as possible. Improved road design can sometimes win back for residential use up to a fifth of the total project area. Remember, however, that roads also serve as firebreaks.



The width of footpaths and roads depends upon the degree of vehicular access which is required. For example, a footpath or access may not be more than one metre wide. A maximum carriageway width of at least 2.5 metres is required to allow for the passage of a large vehicle, whilst a width of 4.7 metres is necessary to allow two trucks to pass at low speed. If the minimum possible road widths are adopted, it is important to allow for the turning circle of a vehicle, which will be at least 7 metres inside radius for a small truck, otherwise such vehicle will not be able to manoeuvre into the side roads. No dwellings should be more than about 75 metres from the road.

Minimising cost of access

Road reserves and adequate spaces between houses are vital to enable emergency vehicles such as fire engines to reach dwellings but there is an enormous difference between the cost of a permanently constructed road and an earth road designed to carry light traffic. At the most basic, an earth road can be kept in good order by sensible practical measures taken in initial construction and subsequent maintenance:

1. Provision of side drains to remove stormwater.
2. Providing the road surface with a camber to discourage absorption of water into the surface after rain.
3. Avoiding shading by overhanging trees or structures which slow down the drying out of the road surface.
4. Keeping side drains clear of grass and rubbish which retard the discharge of water and soften the adjacent earth.
5. When a road descends a hillside taking care to ensure that water running down the side drains does not erode the edges of the road itself. Slowing the speed of flow by introducing weirs of hard wearing material at intervals.
6. If the road crosses a natural water course, installing culverts or small bridges of adequate size, allowing a safety margin over the largest water flow normally experienced.



Secondary access, outskirts of Bogota

Apart from the materials used in culverts and weirs there will be numerous applications where earth roads as described will consume only labour in their construction and will be suitable for self help activities.

Water supply

If wells or springs exist on a site, they can be improved and used for washing and bathing purposes. However, if individual household pit latrines are used for excreta disposal it is likely that the groundwater will become contaminated and a piped water supply, whose source is off-site, is essential.

The options are:

- to improve existing wells or springs
- to provide piped supply to public standposts
- to provide piped supply to individual houses

The relative benefits of public standposts and house connections will depend largely on the overall volume of water available and the tariff structure. If the site distribution system is planned to cater for individual house taps, the community can improve the level of service at whatever pace it wishes by moving from standpost supply to house connections. It will always be necessary to have some public standposts for use by new plot holders who are in the process of building their houses.

The minimum requirement for water is usually put at 30 litres per person per day, but supply above 50 litres brings significant improvements to community health. The cost of supplying 50 litres through standpipes is often little short of the cost of piping to each house, although demand will be considerably higher than this once individual piping is installed. The overall maintenance cost for a system with individual house taps is commonly less than for a standpipe system.

The distribution system should provide for fire-fighting, even allowing for the use of fire-fighting equipment which may not yet be in use by the municipal authority.

Sanitation

The fundamental choice to be made for excreta disposal is between 'on-plot' or 'off-plot' sanitation. The options are:

- 'on-plot': individual household pit latrines
- 'off-plot': communal toilets with septic tank sewerage

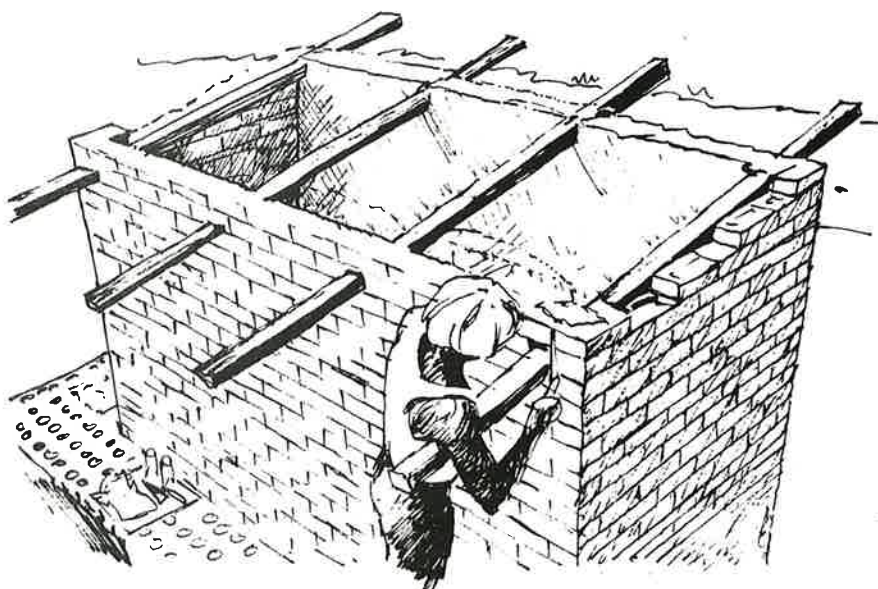
The individual household facility is technically feasible even on sites which are regarded as being 'difficult' because of high groundwater table and high population density. The squatting plate can be located within the house and connected to the leach pit by a length of sewer. This is usually described as an 'offset pit latrine'. The pit can be anywhere within the plot boundary.

Communal toilets usually involve the construction of a large septic tank into which the sewer pipes from a number of toilet cubicles are connected. A standpost can also be provided.

Water-borne sewerage provides a means of removing both excreta and sullage. However there are a number of limitations on its application, including:

- i) House water connections are essential to ensure that sufficient wastewater is generated;
- ii) Both toilet and sullage water must be discharged into the sewer;
- iii) The collected sewage must be disposed of in a suitable way. On-site sewage treatment is unlikely to be a realistic proposition and it is thus necessary that a town or city main sewer be located near to the site into which the site sewer can discharge.

Water-borne sewage is expensive and depends on adequate water supply throughout the year, which is quite rare in squatter settlements. The system soon gets blocked when water supply is limited.



Power Supply

The options for power are:

- house connections to the power lines
- street lighting

It is important to allow for the provision of power when the site layout is being drawn up, even if power is not to be provided at the primary stage. The power utility will usually have regulations concerning minimum horizontal and vertical distances from the building line and roadway: adequate space allowances must be incorporated into the overall site development plan.

Solid Waste Disposal

The collection, transfer and disposal of solid waste is significantly different from the other services because operationally there is a need for labour from the very outset. The community needs to be directly involved in the day to day management from the beginning, whereas other services, such as water supply and roads, will only require an occasional input after an initial period of closely supervised operation.

Each household requires its own solid waste container which must be emptied regularly, preferably every day. The options for removal from the household are:

- carrying directly to a site dump
- carrying to a larger transfer bin serving (say) 80 houses

- carrying to a transfer bin serving each cluster/street
- household collection by labourers

Labourers could be either municipal employees or employed directly by the community.

Elements for infrastructure

The economics of the upgrading programme will be greatly improved if self-help teams, locally based small contractors or individual tradesmen and labourers, are employed and as far as possible drawn from the shanty settlement itself. This produces a requirement for training and strict supervision of quality standards.

At every point in the infrastructure development there will be a need for elements such as bricks, blocks, pipes, paving materials, kerbstones and components to make up bridges and culverts. It naturally follows that local manufacture of these elements should be considered.

But local manufacture should not be undertaken lightly. Anyone contemplating going into production of a building material must face the fact that he will in effect become the manager of a factory. All the normal tasks of production management will therefore begin to emerge and, if not undertaken competently, trouble and waste will follow.

The second chapter on Technical Means, which follows, looks into some of the small scale technologies which might be brought into use in producing elements for the fabric of the upgraded shanty, and the associated opportunities and pitfalls.