

G. T. W. E. P.

NATIONAL WORKSHOP ON RURAL WATER SUPPLY AND SANITATION.

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Orangi Pilot Project

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NATIONAL WORKSHOP
ON
RURAL WATER SUPPLY AND SANITATION

DRAFT REVIEW
OF
ORANGI PILOT PROJECT

LIBRARY, INTERNATIONAL REFERENCE
CENTRE FOR RURAL WATER SUPPLY
AND SANITATION
P.O. Box 115, Addis Ababa, Ethiopia
Tel. (011) 514311 ext 141/142
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I. EXECUTIVE SUMMARY

Orangi is a katchi abadi of Karachi with a population of approximately 0.8 million residing in an area of about 3200 ha to the North West of the city. The terrain is gently undulating rocky desert with numerous gullies (nullahs) at an elevation of about 100 m above sea level. It has been created over the past twenty years as a result of resettlement from East Pakistan and the search by a rapidly growing low-income population for affordable housing. It is now the largest squatter area of Pakistan. This rapid growth has been carefully planned by unauthorised developers to avoid congestion and high population density. Plots are uniformly sized and the roads and lanes regularly laid-out. Some services are also provided by the developers as well as an informal assurance of the freedom from eviction. This has created a climate favourable to the improvement of housing and environment. Average household income is about Rs 2500 per month, and average household size about seven persons.

The Orangi Pilot Project (OPP) grew out of a charitable initiative by the ECCI to assist the refugees. A leading Pakistani social scientist, Dr Akhtar Hameed Khan, was approached to lead such an effort from which he negotiated a project designed to promote the development of people's awareness, the creation of local organisations, and increase their economic, technical and managerial skills. The project started in 1980 and at first tried to strengthen existing organisations and launch new initiatives. It became clear, however, that the highest priority was a sewerage system. OPP began to search for a solution to this problem that could be financed and installed by the community. It argued that such a solution would require that people work together, that it be affordable and much less expensive than the options offered by the municipal authority, and that it be technically simple enough for the people to implement themselves.

OPP has emphasised community participation and the development of low-cost technology. Community participation was organised on the basis of lane organisations of some 20 or 30 houses. OPP recruited social motivators, paid employees from the area, who first held meetings in the lanes to explain the system, and the exorbitant costs of having the local municipality construct it. However, if the lane could work together, then OPP would provide technical assistance. At a second meeting a lane organisation was formed which selected a lane manager who formally requested assistance. At the third stage, OPP technical staff prepared a survey with estimates and gave these to the manager. Finally, the lane collected the required funds and organised its labour contribution. While OPP staff assisted the process, they never handled the money nor attempted to resolve any disagreements.

Initially, some of the construction was substandard and blockages occurred frequently which resulted in a temporary stop to the work. Designs were simplified, basic tools and practices developed and an intensive education effort launched to improve the mixing and curing of concrete and the standard of pipelaying.

A second sanitation phase promoted secondary drains. This used students to undertake a topographical and land use survey with some involvement of the residents. These data were organised by councillor constituencies and presented in public meetings and to each councillor. This resulted in lane organisations coming together for joint projects and requesting OPP for technical assistance.

The communities are now well organised enough for OPP to devote itself almost entirely to responding to requests for technical advice. Using the sanitation program as an entry point it has also addressed a number of other needs in the areas of housing, income generation, health and education.

Total annual expenditures by OPP, on all activities is about Rs 4-5 million which is met by external donors and GOP. Total expenditure by OPP on sanitation research and extension and tools is estimated at Rs 1.7 million which stimulated community investments in sanitation estimated at Rs 10 million. This includes 2230 sewerage lines and 147 secondary drains.

One principal resource utilised by OPP in this program has been the private sector, from which the masons and the manufacturers of concrete pipes, manhole covers and other materials have come. OPP's role has included the training of the private sector to meet the requirements of the program.

servicing for people

Through the OPP, people's technical awareness has been raised, and they have gained the confidence to put pressure on their councillors to carry out work of a standard that is acceptable to them. This has altered the political relationship between the people and their elected representatives.

The OPP experience demonstrates that if suitably mobilised, motivated and technically supported, communities can learn to build, finance and manage services.

11. BACKGROUND

11.1 Physical Conditions

Orangi townsite is situated on the Orangi table land, to the west of the Orangi river, at an elevation of around 200 ft. The townsite is located on a gently undulating rocky ledge with numerous natural drains in the form of gullies and creeks, known as "khalis". The climate is relatively hot (mean daytime temperature varies from 20°C to 30°C during the year) and humid (50 - 75%). Mean annual rainfall is around 4 - 6" and such precipitation that falls is insufficient to flush these gullies. Soils are typically sandy gravels and an underlying strata of shale, approximately 30 ft below ground level, renders the area largely impermeable. The groundwater table varies.

Two main roads converge at the Banaras Chowk roundabout which links Orangi with the rest of Karachi. One leads west to the Sind Industrial Trading Estate (SITE) and on to the port and coastal area, the other runs south, through the middle and lower income residential areas of Nazimabad and Liaquatabad, to connect with the main highways leading out of Karachi.

11.2 Cultural and Social Environment

11.2.1 Social Framework

Orangi is Pakistan's largest katchi abadi (squatter colony) with an estimated population of 300,000. There are an estimated 20,400 housing units organised in 6,200 lanes. About one-third of the population has come to Orangi from outside Karachi; another third has moved from congested inner city areas to the township, while the remainder has come from peripheral areas of Karachi.

The majority of Orangi's population are pioneers of one kind or another. Many have left impoverished rural or urban backgrounds to try and build a better life in a new environment. The high price of legal land in the city means that a wide variety of low-income occupations - including clerks, typists, journalists, teachers and bank employees, as well as skilled and unskilled labourers - are represented in Orangi's population mix. The majority of these people have a long history of urban living behind them, and have higher expectations of environmental standards than a rural population. The mixture of urban and rural dwellers has resulted in the development of a fairly

homogenous urban culture. The communities are eager to work towards an improvement in their physical as well as economic conditions. Levels of education and literacy are also higher than the national average, facilitating the introduction of concepts of sanitation, hygiene and health. Segregation of women is diminishing rapidly, and there are many co-educational schools.

2.2 Land tenure

Twenty years ago, the township was a barren, rocky desert. Its sparse population of pastoral Baluch tribes lived in the primitive conditions found in most parts of Baluchistan, with no access to piped water, sanitation, roads, electricity or other amenities. But the proximity of this area to the industrial area of SITE made it an inevitable choice for the accommodation of Karachi's rapidly growing low-income population.

Orangi's vast physical size (3200 ha, 8000 acres) has meant that there has never been any dearth of room for expansion, and there is still considerable potential for growth. The congestion and high population density found in most inner city abadis is conspicuously absent in most of Orangi, though increasing population pressure and the rise in property values are causing subdivision of plots in some of the older localities. Another important reason for the lack of congestion, however, is that, from its very genesis, Orangi has been carefully planned. The nucleus of the settlement was 1300 acres officially planned by the KDA. The remainder has grown up around this nucleus, plotted out by informal sector unauthorised property developers, or land-grabbers. The result is evident in uniform plot size and regularly laid-out roads and by-lanes.

The informal property market has, in turn, given rise to a complex and sophisticated "parallel administration" in Orangi. The unauthorised developers not only sell plots, but also undertake to supply water and other basic services. One of their most important functions is to provide a channel of communication with the local authorities, whereby plot owners can be assured of freedom from the threat of eviction, and of eventual regularisation of their unofficial land purchases.

The existence of this well-articulated parallel administration gives Orangi residents a considerable sense of security, and an incentive to invest in their houses and physical environment. The success of the OPP in mobilising Orangi residents to finance and participate in its sanitation system reflects this willingness and ability to invest in a better standard of living.

3. Economic Conditions

A high proportion of the families have 2 or more earners employed in the textile industry, carpet-making, garment factories and light engineering industries. Women are engaged mainly in home-based industries such as garment manufacturing and small crafts. Children are employed in the carpet-making and silk-weaving industries and as helpers with motor vehicle mechanics. The area has a vibrant informal trade and services sector which employs about one-third of the labour force. The average household income is about Rs 2,500 per month, ranging from around Rs 1,000 per month to Rs 4,000 per month. Average household size is estimated to be 6.9 persons.

Approximately 35 percent of the population has migrated from other parts of Pakistan and remits a proportion of its income to homes in these areas.

Most residents own their homes and it is estimated that their average investment in property is about Rs 30,000. However, owing to the relatively low levels of disposable income many cannot afford to pay for urban services, particularly at the rates charged by municipal agencies.

A piped water supply has been provided since 1982 and a high proportion of houses have electricity. Approximately 20% of the houses in the officially planned areas have a piped gas supply. This facility can only be extended further to unplanned areas following regularisation.

4. Political Situation

Prior to CPP, Orangi's leadership consisted mainly of the land-grabbers and sub-dividers who had developed the township. The community accepted this leadership, since it was the only link it had with the local administration and as it could lobby on their behalf for the acquisition of services. This leadership had a strong development orientation - as it had developed the township in defiance of government regulations - but it had exploited the people economically and had a strong vested interest in maintaining its control over them. It won the first local body elections in 1979. However, in the subsequent elections in 1983 and 1987 it has been replaced by a younger and more radical leadership which is struggling to establish itself in the face of heavy opposition from the local government bureaucracy. Orangi

has 14 councillors out of a total of more than 200 in Karachi. However, its political strength is much greater than this as it is a volatile area with a high level of awareness and has adherents to every conceivable political ideology.

III. ORIGINS AND RATIONALE OF ORANGI PILOT PROJECT

1. Origins

During the 1970s, over 200,000 refugees from East Pakistan were settled in Orangi. Many were destitute, and a number of charitable organisations undertook relief work in Orangi. Agha Hasan Abedi, president of the BCCI Foundation, wanted to involve his organization and contacted Dr. Akhtar Hameed Khan, the renowned Pakistani social scientist, to organise and manage this work. Dr. Khan informed the BCCI president that he was opposed to charitable work, but if the Foundation would fund a development project for Orangi, he would be willing to direct it. In addition, he made it clear that no targets should be set for this work and that he should be given complete flexibility to develop the project. These terms were accepted and, in March 1980, the OPP was created.

Its primary objectives were to create awareness among the people of Orangi, support the emergence of community-based institutions and strengthen technical, managerial and organisational skills.

2. Rationale

Since the major part of Orangi township consists of squatter colonies, the residents have no legal security of tenure on the plots on which they have built their houses. This vulnerability has determined the terms of their relationship with the local government and made them dependent on an exploitative leadership which acts as an intermediary between them and the local government. Work done by local government in Orangi was always substandard; KMC engineers neither designed nor supervised it. In addition, it was not related to the needs of the residents. Dr. Khan felt that if the people of Orangi could be organised around some appropriate development programme, this unequal relationship between them and their leaders, on the one hand, and between them and the local government, on the other, could be changed. This change, he felt, would result in a better level of services. In a note to the BCCI president in February 1980, he wrote "if social and economic organisations grow and become strong, services, material conditions, sanitation, schools, clinics, training, employment, will also begin to improve." As the process would take time, no well-defined targets or quantifiable objectives were set.

3. Early Evolution of Programme

The OPP initially tried to support and strengthen existing community organisations in Orangi. It also invested money in helping to raise the quality of the local Benarsi silk-weavers' products, and tried to organise the mosque imams for educational purposes. All these attempts failed and led Dr Khan to conclude that the nature of existing institutions did not lend themselves to support as they were primarily lobbying organisations. However, during this period it became apparent that the highest priority need for the people of Orangi was the installation of a sewerage system. But, although they were willing to seek individual solutions for it, they felt that an overall solution was the responsibility of the KMC or the KDA.

Three barriers were identified that obstructed a people's solution to the problem: one, a psychological barrier - the people must be willing to unite and work together; two, an economic barrier - the system should be affordable; and three, a technical barrier - the people should know how to implement the technology and have the necessary tools. The methodology which was subsequently developed aimed at overcoming these three barriers.

III. THE OPP SANITATION PROGRAMME

1. Problems of Providing Sanitation

Research by OPP identified several problems in providing a sanitation system for the squatter colonies. Firstly, the local authorities do not have the necessary finances for constructing a sewerage system. Where international finance is available the problem of a repayment system arises. Secondly, even if repayment is not a problem, international loans can only deal with a small part of an immense problem: there are over 362 squatter colonies in Karachi alone, housing over 35% of the city's population. Thirdly, OPP's research established that the cost of urban services, as developed by the local authorities, is five times the actual cost of labour and materials required for such development, due to bureaucratic overheads, kickbacks and profiteering by contractors. Moreover, users in squatter colonies cannot afford to pay these charges in lump sums, as in Karachi's more affluent areas. Lastly, before the OPP's programme began, the people of Orangi felt that the local bodies should develop their sewerage system free of cost. Their local leadership had led them to believe that the more affluent areas of the city did not pay for the installation of urban services.

2. Peoples' Solutions

At this time, three sanitation methods were in use. Firstly, the majority of people in Orangi used bucket latrines which a scavenger (at Rs 15 per month) would empty out every fourth or fifth day, very often into the unpaved lane. Secondly, the more affluent houses constructed soakpits, which filled up after a few years and did not provide a long term solution to the waste problem. Thirdly, others had laid sewerage lines from their houses to the nearest natural creek, or "nullah." These lines were usually defective, and as there was no communal effort, there were often several parallel lines in one lane. However, in spite of these shortcomings this system cleared the streets of both excreta and wastewater, and if properly laid, no recurring expenditure was required to maintain it.

3. OPP's Proposal

The people had a preference for an underground system. The OPP felt that if the right kind of technical support and tools could be provided, if the lane residents could be organised and trained

to use them, and if the costs of various components of the system could be reduced, then a sewerage system financed and constructed by the people could be developed in Orangi.

The first task of the low-cost sanitation programme of the OPP was to discover alternative sources of finance for development. Dr Khan felt that this could only come from within the community and must be available before the development work was undertaken. Secondly, research to lower the cost of technology was needed to identify a low-cost technology.

Two concepts were viewed as central to the sanitation programme of the OPP: (i) community participation, and (ii) modification of standard engineering technology and implementation procedures to make them compatible with the concept of community participation.

The first step towards building a sewerage system, therefore, was the creation of community organisations based on the lanes, which in Orangi consist of about 20 to 30 houses. This was because it was a small and cohesive unit without problems of mutual mistrust. In addition, the traditional Orangi leadership, which functioned at the neighbourhood level, would not feel threatened if the programme was limited to one lane at a time. However, from a technical perspective, an underground sewerage system is a complex affair, and developing one lane at a time without a master plan was considered by planners to be a recipe for disaster. OPP tackled this problem through technical innovations and modifications to standard engineering practice.

4. OPP Methodology to Provide Community Participation

The development of lane organisations involved four stages. First, the OPP social organisers, who are paid employees of the OPP and residents of Orangi, would hold meetings in the lane. With plastic models for visual demonstration, they explained how the technology worked and the consequences of common construction mistakes or shortcuts. They also discussed the economic and health benefits. They explained that the KDA, or the KMC, do not lay sewerage lines free of cost, and their charges could not be afforded by the lane residents. However, if they formed an organisation in which the whole lane participated, then the OPP would provide assistance. In the second stage, the organisation was born and chose its lane manager who, on behalf of the lane, formally asked for assistance. In the third stage, the OPP technical staff surveyed the lane, established benchmarks, prepared plans and estimates (of both labour and materials) and handed over these data to the lane managers. Lastly, the lane

managers collected the money from the people and called meetings to resolve any problems. The OPP staff supervised the process but at no time did they handle the money or interfere in conflicts or disagreements.

5. Introducing Research and Extension to the Programme

As no central supervision and controlling agency was looking after the work being done, and as people in many cases worked themselves, the quality of work could only be guaranteed by educating the people. However, the OPP found that people who are financing and managing the work themselves cannot be forced to listen to advice, and their confidence in the OPP could only develop over a prolonged association.

In the initial phase of the sanitation programme, no systematic extension effort was undertaken, resulting in poor quality of work in some lanes (for example, incorrect levelling). This in turn created problems in the functioning of the drains. By mid-1982, it became clear to OPP that unless steps were taken to improve technological standards, people would lose confidence in the programme and no new lane organisations would be formed. It was, therefore, necessary to evaluate the methodology of the programme to identify the causes of the substandard work.

Following the evaluation, technical research was carried out to simplify standard engineering designs. The results of this research were taken to the people through a massive extension effort and hundreds of meetings were held. As a result, the people learnt about mixing concrete and curing it, and about the proper manner of making inverts to manholes. Masons were also trained in the OPP sanitation technology and their addresses given to the lanes that applied for assistance. This extension effort led to a great improvement in the standard of work, and an increase in the number of lanes applying for assistance.

6. Secondary Drains and the Councillors' Involvement

As the lane was the unit of organisation, initially only those lanes asked for assistance which were near a natural creek or 'nullah', or those which could drain into such 'nullahs' easily. It was feared by OPP that the programme would end here, unless lanes away from the nullahs came together to construct secondary drains.

To promote the concept of secondary drains, the OPP carried out a physical survey of Orangi. The unit of the survey was the circle

of each elected KMC councillor. Architecture and engineering students from the Dawood College of Engineering & Technology carried out this survey and produced maps showing land use, slope of the land, number of lanes in a councillor's circle, etc. After 30 to 40 students had moved through Orangi, talking to the people and involving them in their work, the concept of secondary drains registered in their minds. This also introduced the concept of development through community participation to the professional universities and colleges, and their growing involvement with Orangi has resulted.

The results of the survey of each circle were compiled along with literature regarding the programme, and given to the councillor of each area. The people were informed of this in motivation meetings, and they started to pressurise their councillors to take an interest in the secondary drains. A large number of neighbourhood lane organisations came together and asked the OPP for technical assistance for construction of secondary drains.

The OPP no longer needs to motivate the people. Through a demonstration effect, lanes organise themselves now and contact the OPP for technical assistance. The OPP organisers increasingly find themselves involved in technical supervision rather than organisation.

7. Operation and Maintenance

Operation and maintenance is also the responsibility of the lane organisations. It consists of:

- a) entire or part cleaning of sewers;
- b) cleaning of individual manholes;
- c) replacement of manhole covers;
- d) repairs to manholes.

The main reason for blockages is the poor quality of manhole covers which get broken or cracked over a period of time. Thus the manhole gets turned into a rubbish dump. People replace them either collectively or individually. However, delays are frequent because small quantities are uneconomical and difficult to make. The new precast covers will alleviate this problem.

When cleaning of sewers is required, money is collected immediately by someone who was involved in the original construction. This typically amounts to Rs 5 per household. A scavenger is then called to rod the line or clean the manhole. A more recent development is that of lanes selecting people to look

after maintenance, which results in prompt action. There has been no evidence to date that maintenance work does not get done, as the people have been anxious to protect their investment.

OPP have found that the amount of maintenance is related to the initial standard of construction. With the improvement in quality since the programme began maintenance has been less frequent and costs have been reduced from Rs 7.40 per lane per month (1981-1983) to Rs 1.08 per lane per month (1984-1985).

8. OPP Research and Development of Low-Cost Technology

Under OPP's direction lanes have constructed their own primary sewers collecting dirty water from the houses and discharging it directly, or via secondary drains, into the nullahs. In some instances, sewers discharge into KMC constructed open surface water drains. The nullahs function as open trunk sewers taking the water away from Orangi and on to the sea by way of the Lyari River. Components of the system have thus been reduced to latrines, manholes and pipelines, all of which can be provided at relatively low cost. Costs have been further reduced through experimentation and innovation as demonstrated in the following examples:

(i) Pipes

Pipes used for the sanitation programme are all manufactured in Orangi. Usually they are 6"-9" in diameter (occasionally 12"), 6' in length, and are of reinforced concrete, using either galvanised wire mesh or light bar reinforcement. They are of inferior quality to those used by KMC; OPP have tested them and they have only 75% of the strength of KMC's pipes. A higher quality is used for the secondary drains in Orangi but these are still weaker than the KMC pipes. OPP are aware of a possible deficiency here but cost has been the ruling factor and no problems have yet arisen. If sewage is allowed to go septic, the inferior quality of these pipes may result in severe corrosion or collapses after a period of time.

(ii) Pipe Joints

Pipes are plain ended and laid end-to-end in a trench in a straight line between manholes with joints consisting of a concrete collar grouted in place. These proved difficult to make and were prone to leakage so OPP discarded the collar and developed the technique of wrapping joints in a jute bandage impregnated with cement slurry. This is simple, cheap and

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Leaving 75 people

One principal resource utilised by OPP in this program has been the private sector, from which the masons and the manufacturers of concrete pipes, manhole covers and other materials have come. OPP's role has included the training of the private sector to meet the requirements of the program.

Through the OPP, people's technical awareness has been raised, and they have gained the confidence to put pressure on their councillors to carry out work of a standard that is acceptable to them. This has altered the political relationship between the people and their elected representatives.

The OPP experience demonstrates that if suitably mobilised, motivated and technically supported, communities can learn to build, finance and manage services.

gradually silted up as a result of the sanitation programme and although this is not yet a problem it may be so before long. OPP has recognised this and is now investigating methods of lining the nullahs with stone pitching to facilitate cleaning. Research is also being done on the following:

- a) regular cleaning gangs for nullahs;
- b) refuse collection to prevent the use of nullahs as a tip;
- c) regular spraying of nullahs with insecticide.

9. Community Contributions

All community investment in sanitation is collected, managed and spent by the lane organisations. Accounting methods are rudimentary and no formal accounts are kept. In many cases one of the older women acts as the treasurer and the lane manager approaches her for any funds that may be required for purchasing materials or paying artisans. As no formal accounts are kept, and because OPP does not manage or handle community funds, no accurate estimate of community investment in sanitation is readily available. However, OPP estimates that owing to the reduction in the costs of providing a sanitation facility to about one quarter or one fifth of official costs, (ie, to about Rs 500 per household for the shared facility of primary and secondary drain lines), the cumulative amount spent by communities upto December 1987 is about Rs 27.9 million which includes the cost of latrines and house connections. Table 1 shows the total estimated community contribution.

TABLE 1

COMMUNITY INVESTMENT IN LOW COST SANITATION
FROM JULY 1981 TO DECEMBER 1987

	NUMBER	COST (Rs)
OPP-Supervised Sewerage Lines	1012	4,039,000
Self-Supervised Sewerage Lines	1218	4,554,000
OPP-Supervised Secondary Drains	109	942,000
Self-Supervised Secondary Drains	38	249,000
TOTAL INVESTMENT		9,785,000

To achieve this level of investment OPP has spent about Rs 1.5 million on research and extension (about 15 percent of community investment). In addition, OPP has invested about Rs 200,000 in tools and equipment which are borrowed by the community to implement schemes. This is an impressive achievement by any standards.

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TABLE 2
OPP EXPENDITURES 1980 TO 1987

(in thousand Rupees)

ITEM	80-81	81-82	82-83	83-84	84-85	85-86	86-87
A. CAPITAL							
Equipment	32	2	1	28	158	650	565
Land & Buildings						235	279
Furniture	40	2	17	31	8		
Transport	48	12	298	258	118		
Audio-Visual	1	15	160	75	28		
Sanitation		20	39	44	63		
Water Drilling		76	227				
Women's Welfare Programme			8		141		
Women's Work Centres					254		
TOTAL CAPITAL	121	127	750	436	770	885	844
B. OPERATING							
Administration	91	203	404	777	760	941	796
Research & Extension	26	65	202	217	206	221	234
Documentation	20	64	88	174	132	155	288
Sanitation		14	144	239	238	243	256
Other Programmes	180	160	303	217	222	1,134	1,899
TOTAL OPERATING EXPENSES	317	506	1,141	1,624	1,558	2,694	4,317

2. Project Management

Dr Khan's role as a teacher and the intense interaction between the OPP and the people of Orangi mean that only those people can survive in OPP who acquire the right orientation, are receptive to new ideas and can learn from successes and failures. The present project team is well-versed in its work and now shows a high level of competence and innovation.

They have learnt a wide range of skills, including technical, social and managerial. Their involvement with the people of Orangi, as well as with the local councillors, has given them an understanding of the political and social context within which development takes place. They have also acquired a detailed understanding of the working of the informal sector in housing and land.

3. Programme Finances

OPP start-up funds were donated by BCCI which initially made a commitment to pay about Rs 1 million annually for research, extension and other related costs. This has now been increased to about Rs 2 million. Following the evaluation of methodology and the success of OPP in creating community participation in development other agencies such as the AKF, Women's Division, GOP, the Canadian Embassy and individual philanthropists have contributed to OPP to fund specific activities. During the last two years, donors have provided between Rs 4 - 5 million per annum covering about 95% - 98% of expenses. OPP funding by external agencies, from its inception in 1980, is shown in Table 3.

TABLE 3

OPP RECEIPTS 1980 TO 1987

(in thousand Rupees)

SOURCE	80-81	81-82	82-83	83-84	84-85	85-86	86-87
A. DONORS							
BCCI	494	900	1,800	2,000	2,000	2,000	2,000
AKRSP/AKF				20		264	195
Population Division					200	115	230
Canadian Embassy					221	300	394
SAAR Foundation					16	16	34
NDFC							450
Rict Repair							1,295
Others			5		5		15
TOTAL DONORS	494	900	1,805	2,020	2,442	2,695	4,613

TABLE 3 (Cont.)
 OPP RECEIPTS 1980 TO 1987
 (in thousand Rupees)

B. EARNINGS

Journal Sales			9	3	14		16
Asset Sales					78	69	36
Publications							3
Interest						30	55
Others	45	11	38	29	6		10
TOTAL EARNINGS	45	11	47	32	98	99	120
TOTAL RECEIPTS	539	911	1,852	2,052	2,540	2,794	4,733

VI. PROGRAMME ACHIEVEMENTS

1. Economic and Infrastructural

OPP's major economic achievement is the mobilisation of funds from within the community to finance the sanitation programme. In the six and a half years since July 1981, OPP has been able to promote a total of 2,230 primary drains in the initial OPP area, a coverage of about 66 percent.

The effect of improvement in the sanitation facilities of houses has been a perceptible increase in property values in those lanes where primary drains have been constructed.

Where lanes are located at a distance from the nullahs, OPP suggested that lanes should get together to install secondary drains. By the end of December 1987, 147 such drains had been financed and constructed by the community. In addition, OPP identified and supervised the construction of 26 such drains which were financed through KMC councillors' allocations. Community investments in the sector are estimated at about Rs 10 million.

OPP has demonstrated the effectiveness of an unconventional approach to urban sanitation. Sanitation experts believed that because a water-borne sewerage system is complex, it could not be constructed piecemeal without a master plan. Furthermore, it was considered inappropriate to the people's needs. Pour-flush latrines with soakpits were recommended to seal excreta and prevent waste water flowing in open drains, and because of the initial inadequate water supply. Moreover, discharging sewage into the nullahs does not solve the problem but moves it into the natural watercourses, where it remains a health risk and pollutes the environment.

However, Orangi's situation required an unorthodox approach. OPP has neither the resources nor authority to formulate and execute a master plan. Adopting soakpits was not feasible because they already overflowed into the streets. Moreover, they would preclude the future upgrading to a fully water-borne system and would be totally inadequate in the event of a reliable piped water supply. This was proved in 1983, with the increase in waste water after the new supply which caused the shallow water table to rise and large areas of Orangi to become waterlogged. Since most of Karachi discharges untreated sewage to the sea, OPP considered the engineers' objection to it also doing so to be unreasonable.

The OPP has proved that it is possible to construct a sewerage system from small units based on lanes. The technology that has been adopted is low cost and, despite being constructed with inferior tools and materials, work has often been executed to a higher standard than that done by the KMC and its contractors in the area. It has also been assisted by the favourable topography in the form of the nullahs and the natural ground slopes, which influenced the choice of technology.

Traffic in the lanes of Orangi is light and infrequent. Therefore the positioning of sewers in the centre of lanes at depths of around two feet, as is common, and light duty manhole covers are acceptable modifications of standard practice. However, where sewers (usually secondary drains) run along larger roads they have been offset to one side and are of a better quality pipe. Not all engineering principles have been ignored; "commonsense engineering" has been employed to produce solutions which are appropriate to the community's needs and resources.

The choice of a fully water-borne piped sewerage system, and the manner in which it has been constructed (i.e. with design specifications similar to those of KMC), have resulted in a system which could be incorporated into a municipal plan for the whole of Orangi. Principal sewers could be constructed to intercept the OPP-constructed sewers prior to discharge into the nullahs. Wastewater would then be conducted away from Orangi for treatment or disposal elsewhere. This would enable a programme for cleaning the nullahs to begin.

2. Social and Institutional

The physical results of OPP's work are easily visible, but even more important are the social and psychological changes which have taken place in Orangi because of the OPP. Lane organisations and the OPP itself are both important new organisations. Two kinds of cadres have been created: the OPP's own staff, particularly its social motivators, and the managers of the lane organisations.

The social motivators are all local people, with a background of social and political activism, and they are familiar with the people and conditions of Orangi. They were good communicators and have improved their organising skills.

The building of the sanitation system brought people together for a common purpose, in the lane organisations. Though not formal

without proper tools and proper supervision. The results are clearly seen alongside many of the roads in Orangi. However, after continual pressure from OPP, and more recently as a result of growing awareness among the people of Orangi, KMC councillors have been persuaded to bend their rules and allow underground drains to be constructed with municipal funds. More significantly, at the request of the community they have allowed OPP to locate and design these secondary drains and supervise their construction. This will be of obvious benefit to all if the area is regularised at some future date. It is also a powerful indicator of the concern which the people of Orangi now have for adequate sanitation.

4. Private Sector Stimulation

The stimulation of the private sector has been one of OPP's major achievements. OPP has been instrumental in training masons in techniques developed for the sanitation programme; in demonstrating the benefits of modified concrete mixes for manufacturing blocks used in construction; and in developing a market for ready-made manhole covers, thereby involving thailawallas and other similar contractors.

VII. KEYS TO PROGRAMME SUCCESS, AND CONSTRAINTS

Several factors have contributed to OPP's achievements in community-based development projects:

1. Dr Khan's role:
 - extensive previous experiences in rural development used to evolve an effective model for urban low-income areas.
 - his role as a teacher and motivator, both within OPP and in the larger community.
 - an ability to attract funding while retaining relatively independent control of the project.
 - his contacts with the bureaucracy and other institutions, which facilitated the development of their linkage with OPP.
2. Favourable Context:
 - physical features which facilitated the use of a low-cost technology.
 - the responsiveness of Orangi's people, their high levels of political and social awareness, and the relatively high levels of education and skills.
3. A Flexible, Responsive Methodology:
 - the original programme was not restricted by specific targets or a rigid choice of technology.
 - the ability to learn from failures and successes, and to adapt the programme and methodology accordingly.
 - the lowering of costs to an affordable level through the development of appropriate technology.
 - mobility of personnel, achieved through a good supply of vehicles.
4. Back-up:
 - the involvement of educational institutions (achieved through personal links) which supported the OPP's research and extension facilities.

VII. RECOMMENDATIONS FOR SECTOR STRATEGY AND POLICY

The specific recommendations for the sector that arise from the OPP experience are:

1. The adoption of a model of implementation of water supply and sanitation projects with four components of social investigation, community mobilisation, research and development into appropriate technologies, training and dialogue.
 - social investigation to identify the appropriate form of community organisation to manage other projects;
 - social mobilisation to establish a community organisation;
 - continuing research and development into affordable sector technologies and the extension of these findings to the communities;
 - effective and continuing dialogue with community organisations and training in basic technical and management skills.
2. A broadly based community organisation should have final control over the design, pace, local organisation, and financing of the project.
3. Government staff should be exposed to the OPP experience in the sector through field visits and exchange of experience.
 - similar training is already provided by OPP to students at the staff colleges and National Institute of Public Administration. Such training should be broadened.

APPENDIX
ABBREVIATIONS AND ACRONYMS

AKF	Aga Khan Foundation
BCCI	Bank of Credit and Commerce International
GOP	Government of Pakistan
KDA	Karachi Development Authority
KMC	Karachi Metropolitan Corporation
NDFC	National Development Finance Corporation
OPP	Orangi Pilot Project
SITE	Sind Industrial Trading Estate