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ORANGI PILOT PROJECT-
COMMUNITY PARTICIPATION AND MODIFICATION IN
SANITATION TECHNOLOGY

by

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IN SANITATION TECHNOLOGY

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1. COMMUNITY PARTICIPATION AND TECHNOLOGY

Two concepts are central for the understanding of the Sanitation Programme of the Orangi Pilot Project:

1.1 COMMUNITY PARTICIPATION

The Sanitation Programme is a result of a need to develop local organizations in Orangi and not the other way round. The concept is spelt out in Dr. Akhtar Hameed Khan's 25 February 1980 note on Welfare Work. He says, "if social and economic organizations grow and become strong, services and material conditions, sanitation, schools, clinics, training, employment, will also begin to improve".

1.2 MODIFICATIONS IN TECHNOLOGY AND IMPLEMENTATION PROCEDURES

Standard engineering technology and implementation procedures, the product of the traditional client, engineer, contractor relationship, have to be constantly modified to suit the new system where the user, organizer and implementor are

one, and often they have little or no technical knowledge or artisanal skill. This paper seeks to illustrate these two concepts.

2. PRE O.P.P. SOLUTIONS TO THE SANITATION PROBLEM

Before the OPPs low cost sanitation programme was accepted by the residents of Orangi, three solutions to the problem were commonly used.

2.1 THE BUCKET LATRINE

The bucket latrine usually consists of an exide battery shell which used to be placed in the toilet. The sweeper would remove this shell, throw out the excreta into the natural nullah or street, and then replace the container. The waste water in this case flowed out into a cesspool or into the street. Apart from creating severe environmental pollution and health hazards, the owners had to pay about Rs:15/- per month to the sweeper who in most cases was difficult to find.

2.2 SOAK PITS

The more affluent residents dug soak-pits in their lanes. These soak-pits were connected only to the foul water system of the house. The waste water

still flowed out into the street. These soak-pits usually filled up in 2 or 3 years, after which they filled up after every three to six months. The cost of having a soak-pit emptied by the KMC truck mounted pumps was Rs:75/-. This was a major drain on the people's resources and at the same time did not solve the waste water problem.

2.3 SEWERAGE LINES:

Some residents of Orangi also laid sewerage lines from their houses to the nearest natural nullah. It was seldom that a whole lane or mohallah undertook this work together. In the absence of community organizations, we find that many parallel drainage lines have been laid in many lanes. The work carried out also suffered from technical shortcomings, and was in most cases substandard. Consequently the drains clogged up frequently or their different elements weathered badly. However, in spite of these shortcomings, this system cleared the streets of both excreta and waste water, and there was no recurring expenditure to maintain it. The OPP felt that if an effective lane organization could be developed, and if the right kind of technical support and tools could be provided to it, and if the lane residents were trained to use them, then an underground drainage system could be

developed in Orangi.

3. OPP'S METHODOLOGY FOR DEVELOPING LANE ORGANIZATION AND TECHNICAL SUPPORT

OPP's methodology for developing lane organizations and technical support has been explained in detail in OPP publications. Briefly it consists of 4 stages:

3.1 MOTIVATION

In this stage the OPP motivators hold meetings of lane residents and explain the OPP low cost sanitation programme. They stress that without the formation of such an organization the OPP cannot give any technical assistance.

3.2 ORGANIZATION

In this stage the organization is born and it chooses its lane manager, who on behalf of the lane formally applies to the OPP for assistance.

3.3 TECHNICAL INPUTS BY THE OPP

The OPP technical staff surveys the lane, establishes bench marks, prepares plans and estimates (of both labour and materials) and hands over this data to the lane managers.

3.4 IMPLEMENTATION

The lane managers collect the money from the people, call meetings to sort out any sociological problems which may occur due to the undertaking of this work, receive tools from the OPP and make arrangements for carrying out the work. The OPP staff give top supervision to this work.

4. MANAGABLE SOCIAL ORGANIZATION DETERMINES PHYSICAL SIZE OF SANITATION UNIT

To organize people on a large scale without existing smaller organizations is impossible. The organization unit therefore was limited to a lane. As such physical planning was done for one lane at a time. Invariably in the beginning only those lanes accepted the programme which were near a natural nullah or could easily discharge into it.

5. EDUCATING THE PEOPLE

As no central supervision and controlling agency was looking after the work being done, and as people in many cases worked themselves, the only way of guaranteeing the quality of work was by educating the people. However, 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". As such certain sub-standard work was done in the lanes by the people, and in mid 1982 there was a lull in the programme. As a result an evaluation of the concept, design and implementation procedure became necessary.

6. EVALUATION

An evaluation of the OPP low cost sanitation programme was carried out by us in September 1982, and it showed up 3 main weak points. In addition, there were the criticisms and proposals of our UN experts which had to be answered.

7. THE THREE WEAK POINTS AND THE PROCESS OF OVERCOMING THEM

7.1 THE DESIGN CONCEPT

As per the initial designs of the OPP, the sewerage along with the excreta was discharged into the open nullah. All such nullahs have high density housing on both sides. This meant that the problem of the lanes was simply being shifted to the nullahs, creating serious health problems. In addition, it was discovered that many sewerage lines would clog up occasionally and as such had to be cleaned out. This problem was studied and it was discovered that due to a lack of water

the proper flow of sewerage in the lines was not possible.

To overcome these 2 problems it was decided to place a one chamber septic tank, or "haudi" as it is known in Orangi, between every connection and the sewerage line. This prevents the solids from flowing out into the drain. The size and design of the "haudi" was determined not as per any engineering standards but by its cost to the user. It had to be of a cost that the people could afford. As such, the first haudis were put under observations, and are still being monitored. The results are interesting and we hope to publish them soon.

To popularize the "haudi" and educate the people on this subject, a lot of meetings were held, posters were prepared and posted on walls in the lanes, and leaflets were distributed. The "haudi" is now a widely used element in Orangi.

7.2 THE DESIGN OF ELEMENTS

7.2.1 MANHOLES

Manholes used for our initial work were either copies of the cast-in-situ KMC models or were made by masons with block masonry. The former

were far too large and their concrete sections too bulky. The later required plastering and artisanal skill. As such both models were uneconomical. We therefore introduced cylindrical cast-in-situ manholes of a manageable size. Shutterings for these manholes were prepared and made available to the people. Thus artisanal skill was replaced by tools that the people could use themselves. As such the cost of a manhole was reduced to Rs:120/- from Rs:400/-

7.2.2 MANHOLE COVERS

Manholes covers were originally made of RCC with steel rims as per KMC designs. They were expensive to make and required artisanal skill. As they were light, people lifted them up and put garbage into the manholes. To prevent this from happening the manhole cover was transformed into a simple rectangular concrete slab which was too heavy to lift easily, and which projected beyond the manhole chamber. This took care of both the high expense and the vandalism problem.

7.2.3 POSITION AND DEPTH OF SEWERAGE LINES

The sewerage lines are laid in the centre of the lanes. The reason for this is that if they were laid at one side, then some houses would require longer length of pipe to make their connections. This would create serious sociological problems, and the people feel that they will not be able to cope with them.

It was felt by us that the manholes and lines being in the lane centre, and subject to traffic would collapse under the weight of a road roller, when, and if, the lanes were paved. However, when paving did take place the people of their own accord filled up the manholes with sand. This served two purposes. One, it strengthened the manhole structure to withstand the roller pressure; two, it made it possible for the lane residents to remove the carpeting on the sand filled manholes easily, empty them out, and replace the manhole covers. As such no manholes or lines have been damaged due to paving. This solution by the people was possible only because of their lane organization, their involvement in development work, and

their constant contact with sanitation technology in the form of OPP advice.

We had advised the people to lay the lines at a minimum of 2'-6" below ground level so as to withstand the weight of heavy traffic. However, the people in many cases have laid the lines at as little as 1'-6" below ground level. As none of these have collapsed due to heavy traffic, we now insist that only lines on main streets be laid at a depth of 2'-6".

7.3 QUALITY OF WORK

7.3.1 INFERIOR QUALITY OF CONCRETE

It was discovered, that inspite of our extension work, proper aggregate cement ratio was not being maintained, and that in some cases earth had also been scooped up and mixed in the concrete.

To remove these discrepancies, small metal sheets for mixing concrete have been proposed so that the concrete should not be mixed on the ground. In addition, proper measuring boxes for aggregate, and rods for rodding of concrete are now given along with other tools. These have greatly improved the quality of concrete.

7.3.2 INSUFFICIENT CURING

The masons or petty contractors employed by the people did not cure the concrete properly, and there was no way to force them to do so as our supervisors were not always there. To remove this defect, posters and pamphlets explaining the necessity of curing were posted and distributed in the lanes where work was being done. At lane meetings our managers have also explained the necessity of curing to the people. As a result, it is common to see lane residents pouring water on the joints and manholes that fall before their houses. Also pressure, in many cases overt, is applied on the masons and contractors to cure concrete.

7.3.3 CROOKED LINES

In some cases the sewerage lines were not laid in a straight line from manhole to manhole as they should be. The problem was studied and it was decided to make string, chalk and pegs available to the lane people and to instruct them in their use. As a result all lines being laid now are in a straight line from manhole to manhole. Again the availability of tools, and instruction in their use, has improved quality.

The above rectifications and modifications suggested by us were implemented slowly over a period of time. If all our suggestions had been forced upon the sanitation programme at once, our lane managers would not have been able to assimilate them, and the people's confidence in themselves and in our organizers would have been badly damaged. Such a radical change would have brought the programme to a halt. However, since February 1983, the work being done by the people with OPP advice is excellent, and we have taken further steps to help it.

The OPP has also engaged a full time plumber who gives top supervision to the sanitation programme, and in addition, the OPP has commenced a programme of training masons on the theory, design and implementation of its low cost sanitation programme. The names and addresses of the trained masons are given to the lane residents so that they may employ one of them for their work. Monitoring of the results of the work done by these masons shows a marked improvement in the quality of the sanitation programme.

8. CRITICISM AND PROPOSALS OF THE UN EXPERTS

Between September 1982 and January 1983 the OPP had the benefit of a UN advisor and several visits were made to the project by UN experts. They had 2 main criticisms of the low cost sanitation programme:

8.1 EXCRETA SHOULD BE SEALED

Our UN experts felt that the laying of sanitation lines should be stopped. That the OPP should adopt the twin leach-pit system for each house so as to completely seal the excreta, and that the waste water should flow in open drains. They felt that the large gauge pipes we were laying complete with manholes were a waste of the people's money, when there was not enough water in Orangi to make our traditional sewerage system function. They further said that even if the leach-pits were not acceptable to us, we should discard the RCC pipes and manholes and replace them with 2" pvc pipes. Our making of haudies, they informed us, had obliterated the use of large gauge RCC pipes and manholes, and to insist on making them they felt was not only uneconomical but irrational.

We did not agree with the proposals of the experts. First, because we knew that the people aspired to a traditional sewerage system which is common all over Karachi. Second, we also knew that when water would be made available to the people of Orangi, the leach-pits would fillup quickly. Third, open drains require constant maintenance and pose health hazards. We also rejected the

proposal of doing away with manholes and RCC pipes because we felt that a day would come when there would be enough water in Orangi for a normal sewerage system to work, and that our programme would become a movement for sanitation in the lanes of Orangi. Our sanitation programme, we felt, would develop pressures on the community for secondary drains, and on the local government for the preparation of the big drains. We did not wish to seek a narrow solution to an immediate problem that ignored the social dynamics we were setting in motion. We wanted the people to add incrementally to their lanes solution, and eventually build a normal sewerage system.

Time has justified our approach. Since last year Orangi is getting 35 million gallons of water from the Hub river dam. All soakpits are filling up rapidly. In fact, in many low areas waterlogging has become a menace. There is no alternative for Orangi. It must have a non-leaking underground sewerage system, as the people wanted, and as was promoted by OPP. Its cost, at three levels, (the sanitary latrine in the home with T-pipe haudi, the underground sewerage pipe line in the lane, and the underground concrete pipe secondary drain) comes to less than Rs:1000/- per house. The house owners regard this as quite economical.

8.2 WE WERE WORKING WITHOUT A MASTER PLAN

Our UN experts were very critical of our working in the lanes without a Master Plan, as were some of our planner friends. We appreciated the fact that as per engineering practice a complete survey of the area, with levels, sectors, secondary and main drains was essential. However, we are not a planning agency and have no authority to get our plans implemented. The work we were carrying out was being done only because of our communication and understanding with lane organizations, and bigger units of organization were not possible. We hoped eventually to join up the lanes into secondary drains and the secondary drains into nullahs. Our advisors feared that we would not be able to proceed beyond the lanes that bordered the open natural nullahs, and that the programme would end there.

However, we felt that if the people, now organised at lane level, were educated regarding this problem, and if the local councillors could be made to get involved in seeking a solution to it, we could proceed further. The technical solution posed no serious problem.

It was the creating of an awareness and co-ordination in the whole mohallah that was necessary. It was the building up of social pressure that was needed. We decided to work towards it.

9. CIRCLE HAND BOOK AND THE SECONDRY DRAINS

To promote the concept of secondry drains it was decided to survey the Circle of each Councillor. The physical survey was undertaken by engineering and architecture students and they were helped and assisted by the OPP workers, and Orangi residents. The plan of each circle was prepared. The plan showed the slope of the land; lanes developed by the OPP; lanes developed by the people; land use pattern; number of houses; number of lanes; existing nullahs. This survey and preparation of hand books has continued for many months. The survey could have been carried out by professional surveyors in a short period of time. But we carried it out as we did for 4 reasons:

- 9.1 To promote an understanding of the sewerage system among the people, without which no community work was possible.
- 9.2 To take the concept of development through local participation to the professional colleges and universities.

9.3 To involve the councillors by making the circle a unit.

9.4 To educate our own workers and the people of Orangi.

Because of involving the people and their representatives in the survey, whole mohallas are now coming forward to have their lanes and secondary drains built. The councillors on the basis of the information we have provided, are asking us to prepare plans and estimates so that they may pressurize the KMC into financing the people's schemes. But the most important part is that the councillors, the KMC contractors and the professionals, are dealing increasingly with a population that understands sanitation technology, appreciates good quality work, knows costs, and as such will not permit kickbacks and profiteering. Due to this reason there have been instances of people wishing to get their own secondary drains built rather than pay the high cost of KMC development. The sanitation programme now has the makings of a movement.

10. SOME TECHNICAL CONSIDERATIONS FOR SECONDRY DRAINS

The design of secondary drains is a more complex affair than the lane drains. For this purpose two NED final year students, who have worked on the survey in Orangi,

have prepared a hand book for the calculation of slopes, sizing and limiting velocity. Members of the OPP staff have been trained to use this manual.

As there is no master plan it is sometimes difficult to relate an economical slope for the line to the geography of the land. In a few cases levels worked out by us have ended in a junction of the secondary drain with the nullah at a level well below the nullah bottom. To overcome this problem we now have levels worked out from the nullah base upwards. To further minimise the risk of such an eventuality, all slopes in the lanes are kept to a minimum, except where natural slopes are available.

11. SUCCESS OF THE SANITATION PROGRAMME

The success of the sanitation programme can be judged from the fact that out of a total of 2600 lanes in our part of Orangi, 1200 have already built up their drainage system. Of these 672 have done it with direct OPP advice. In addition, about 50 secondary drains have been, or are being laid. It is felt that if the KMC does not develop the main nullah, the people might attempt to do it themselves. There is already talk of this in the lanes of Orangi.

The house owners have understood the importance of sanitation and sewerage, not only to safeguard their health from infectious diseases, but also to save their valuable houses from waterlogging. As soon as this attitude develops, they are ready to find the financial and managerial resources required for the construction of the low cost sanitation system.

Zaidi