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Solid waste management in a katchi abadi

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INTRODUCTION

Katchi Abadies are common features of all the large and small cities of Pakistan. Karachi with 10 million population has 460 Katchi Abadies while Sukkur, comparatively a small town of 2.6 million people, has 29 such townships. These abadies are haphazard unplanned encroachments cropping up on no man's land with zero civic amenities. The majority consists of people migrating from rural areas due to economic constraints. One come to stay, these abadies get regularised and the provision of the basic amenities, assumes top priority due to prevailing sub-human environment. The open drains and uncontrolled solid waste dumps on streets and in open space provide a favourable habitat for disease carriers such as rodents and flies causing health hazards to residents, particularly children because they stay back in home and are more exposed to this unhealthy environment. The provision of basic infrastructure, i.e. water supply, sanitation, drainage and solid waste disposal system is a very complex problem due to unplanned growth, narrow lanes open drains and zigzag layout etc.

Investigations were carried out for a typical Katchi Abadi of Newpind, Goltakri and Kaan situated in outskirts of Sukkur with a total area of 311.7 acres and population of 30500 people, for an ultimate objective, to arrive at a cost effective, simple and sustainable solid waste management system through community support and participation.

The paper briefly presents the methodology adopted and the results and conclusions of the study carried out to achieve the objective mentioned above.

METHODOLOGY

In order to assess the existing situation and future pattern of Solid Waste Management in Sukkur and the Katchi Abadies following approach was adopted:

1. Interviews and discussions with civic authorities, community leaders, area councillors and active social workers.

2. Socio-economic survey of randomly selected inhabitants covering 5% household units.

3. Collection of garbage samples from randomly selected house-holds, to estimate waste composition and generation rate.

The discussion with the local community leaders brought forward a good deal of original thinking towards the solution of the problem. The local genius always help to find the most natural solutions to the problems which prove to be sustainable in the long run than as compared to

Table 1: Parameters and Variable for the Socio-Economic Survey

S.NO.	PARAMETER	VARIABLE	S.NO.	PARAMETER	VARIABLE
1	Area	Numerical	11	Sex	Male, Female
2	Street Condition	Exposed Refuse, Exposed Wastewater, Unpaved Street, Exposed feaces	12	Occupation	Skilled worker, Unskilled worker, Clerical, Student Unemployed, Household chores unemployed, others
3	Construction	Pucca, Semi Pucca, Katcha	13	Education	Numerical, Class level
4	Storeys	Numerical	14	Source Separation	Yes, No
5	Rooms	Numerical	15	Resaleable Items	Bottles, Tins, Metals, Newspapers, Plastics, Glass, Paper, Others
6	Toilet	Pour Flush, Squatting	16	Sale Price	Itemwise
7	Occupancy	Owned, Rented, Others	17	Market Place	Street Collector, Middle Dealer, Main Dealer, Scavengers
8	Tenure	Numerical	18	Comments/Suggestion	Deseriptive
9	Family Size	Numerical			
10	Age	Numerical			

the imposed ideas and solutions.

A survey of 196 households out of a total of 3800 was conducted covering 1210 (630 male and 580 female) out of 30500 people. This gives 5% coverage on randomly selected basis. A greater coverage though was desirable but could not be achieved due to time and financial constraint. Ten surveyors were trained to conduct the survey. Table 1 gives the parametes and variable covered in the socio-economic survey.

Large size plastic bags were provided to the randomly selected 150 houses who were asked to fill it over a period of 24 hours. The bags were collected back, weighed and throughly mixed. Using quartering standard technique and standard USEPA method following parameters were determined:

1. Generation rate (per capita)
2. Bulk density
3. Moisture content
4. Physical composition

RESULTS

All the data obtained was fed into computer and analysed using Lotus, Quattro and dBase III Software packages.

The solid waste of the project area is domestic in nature and the average generation rate was found to be 0.36 Kg/day/c. The future trends show that the total generation may increase with the increase in population, however density will decrease due to change in physical composition i.e. reduction in dust, ash and mud content etc., (being 68% now with the decreasing trend of building Katcha houses). For the year 2011, the generation rate has been estimated at 24 ton per day (based on 3.5% rise in population) as against 12 ton/day at present. Table 2 provides the physical composition of the solid waste from Katchi Abadies and data from other cities of Pakistan and U.S. origin have been included to provide a comparision.

The bulk density is quite high and ranges between 204 to 414 Kg/m (average 313 Kg/m) and moisture content ranges between 14% to 26% which is on low side as compared to a typical value of 30%.

The socio-economic survey conducted in the area reveals that the prevailing disposal practices for household solid waste involve 43% use of sweepers and 57% by the family members themselves. About 79% residents throw their garbage on daily basis, while remaining on alternate days or twice a week. Only 5% throw the garbage into the only one available assigned dump, while majority 36% at the Lane End, 26% on vacant plots, 5% in open drains and the rest wherever they desire. Thus 70% dispose off their garbage in the immediate environment, which remains there and offer an ideal breeding ground for mosquitoes, flies and rodents.

The survey also shows that the 10-14 years age group constitute 45% of the total population indicating a major population explosion in the next 10 years which would greatly burden the existing low grade solid waste management system and this fact has to be kept in view while planning for the future.

DISCUSSION

High percentage of inert material i.e. dust, mud and ashes (amounting to 68.5%) are due to Katcha houses and unpaved streets causing dusty environment. The basket type latrines (27%) also partially contribute to the solid waste as sweepers throw it

Table 2: Physical Composition of Solid Waste

S.NO.	COMPONENTS	US ORIGIN (Report 1989)	THIS STUDY (%)	KARACHI (Report 1985)	ORANGI (Sinntaby 1984)	LAHORE (Report 1984)	ISLAMABAD (Ehsan 1988)
1.	Garbage (including food waste meat but excluding bones & shells)	6-26	6.65	20.91	63.0	44.42	58
2.	Paper	24-45	2.35	16.63	4.8	20.26	10
3.	Textile	0-4	2.35	8.07	.....	3.11	5
4.	Wood. Grass, Straw	1-4	9.39	17.80	1.1	2.6	20
5.	Plastic	2-8	1.96	5.35	1.7	.....	.....
6.	Leather & Rubber	0-4	0.34	0.51	1.2	.....	3
7.	Ferrous Metal	1-4	0.23	2.08	0.3	.....	.....
8.	Non-Ferrous Metal	0-1	0.08	.....	.....	.....	.....
9.	Glass	4-16	1.56	3.71	0.9	1.03	3
10.	Stones, Ceramics and Bones	.....	6.65	3.37	.....	.....	.....
11.	Dust, Ash, Mud	0-10	68.45	10.84	12.5	21.30	10.84

at dump sites. The overall low percentage of organic biodegradeables and combustibles implies that the waste is not suitable for composting or resource recovery in the form of heat, refuse derived fuels etc. Resaleable materials are also low due to poor economic condition and therefore recycling option is uneconomical. The only viable disposal option is sanitary land filling. The low moisture content will generate less leachate at the disposal site.

Presently there is only one assigned disposal dump for the garbage. As a result the garbage is being dumped every place possible including nearby ponds filled by wastewater collected in the natural depression, thus creating extremely unhealthy environment. Based on the data collected, an economical and sustainable three tier disposal system is proposed, in which the residents dump their refuse into subdumps located in the close vicinity, from where it will be transfered to the four main dumps, sited along the periphery of the project area. The final link of transporting the refuse to the sanitary landfills will be carried out by the Sukkur Municipal Corporation (SMC) trucks.

In all fifty, subdumps of 1 cum capacity are propsed for the three Katchi abadies. This figure is arrived at on the basis that each one will cater the need for 75 houses and are located at a maximum distance of not exceeding 400 meters from the houses so that there is an incentive for the residents to use them and also for the convenience of the sweepers cleaning the streets. The subdumps will be of 1.5m(length)x 0.9m(width)x0.8m(depth) raised on a plateform of 0.3m high, constructed of block masonry. The total height will become 1.1m so that any one can throw the refuse over the walls of the subdump with ease. The subdumps will be emptied on daily basis and with the generation rate at 0.36 Kg/day/ capita the free board in the subdump will be about 0.3m. Each subdump is estimated to cost Rs.2000 and will be built by the community to create a sense of participation. The subdumps will be linked with four main dumps of 10 cum capacity each, being 3.5mx2.0mx1.5m deep. Filling and emptying ramps have been provided to minimise manual efforts in dump by and the removal of the garbage. The dumps have located at a distance of not exceeding 650m from any of the subdumps to optimise the transfer of the refuse. The garbage removal frequency will be on daily basis and will be carried out by the S.M.C. trucks.

Due to very narrow lanes a combination of trollies and Suzukis adopted for the transfer of refuse from subdumps to main dumps can be used. One Suzuki refuse van and ten wheel borrows per dump will cover the total needs of the area. The wheel barrows are modified with double wheels for stability and raised capacity from 0.3 cum to 0.5 cum. Similarly the Suzuki pick up will be modified to refuse van with all the three sides raised to a capacity of 3.5 cum and hinged for convenient unloading.

It has been observed that environmental improvements can not be achieved without the active participation of the community. No amount of investment and infrastructure facility by the Civic bodies can help in sorting out environmental issues like water, wastewater, solid waste, air pollution etc. without the cooperation of the concerned public. Therefore it is proposed that "Mohalla Committees" should be formed comprising of area activitist, councillors and social workers, for each subdump covering 75 houses. Each committee will look after the waste management in their respective areas. Following role is expected of them:

1. Motivate the residents to dispose their refuse properly in the subdump.
2. Guide the residents not to throw their garbage on the street.
3. Check the sweepers that they clean the streets and empty the subdump every day located in their area.
4. Communicate any problem in their area to the SMC through their chairman area councillor.

The community education through awareness programme is essential for the success of the solid waste management. While it is difficult to get reliable data on the income of the residents, the number of Television sets, Radio etc. owned indicates the standard of living and also if the use of electronic media would be effective in improving community participation in solid waste management. The results show that 67% residents own

T.V. sets while 48% have radio sets and therefore these two would be quite effective in creating community awareness and their responsibilities towards maintaining better environment. This can be achieved through television, radio and in local meeting through lectures and discussions.

CONCLUSION

While infrastructure facilities lack and need to be enhanced and designed on scientific lines, the sense of responsibility on the part of the users and their cooperation is essential, without which no management can succeed to creat a healthy environment.

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