TECHNICAL NOTE

LIQUID WASTE DISPOSAL IN URBAN LOW INCOME COMMUNITIES A CASE STUDY

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One of the major challenges facing urban sanitation is the effective and sanitary disposal of liquid wastes. This is even more so in highly congested and unplanned areas, as the quantity of sewage increases in proportion to the number of inhabitants

In the ideal case the liquid waste can safely be disposed of in a properly designed and integrated network of pipes, which collect and transmit the liquid waste into a treatment plant However, such a system is costly and needs a substantial amount of initial investment to start operating and subsequently to maintain. Therefore, in instances of inadequate funds and space, conventional sewerage is too expensive and other alternatives have to be explored

In the past, the urban population was seen as having better access to basic services than those in the rural areas. However, due to the rapid increase in population and the continuous influx of people to urban areas in search of better economic opportunities; the result has been overcrowding, poverty, health problems and an ever increasing strain on basic infrastructural services.

Recently, there has been an increased emphasis on alleviating urban poverty and related problems; the basic philosophy of such an approach is dealing with the problems in an integrated manner: addressing the housing, infrastructural services, health, waste management, etc. at once. For an effective sustainability of such activities, the participation and commitment of the community should be stressed and appropriate low cost solutions sought.

To this end, various government and NGOs have been addressing those and other needs in the low income residential areas of Addis Ababa. One of the NGOs active in the poorest sections of the city was OXFAM-UK a UK based NGO. It operated in 'woreda'[1] 4, 'kebele'[2] 29 i.e. one of the nine overcrowded and low income kebeles found in an area known as "Teklehaimanot Awraja".

General data on kebele 29

Area	=	10.2 ha
Population	=	6000
No. of families	=	978
Family size	=	6.5 pers/fam
Houses	=	895
Residential use of house	=	95%
Business use of house	=	5%
Average income	=	<50birr/month

Data on water supply

Type of water point	No. of houses	%
Public water point	116	13
Shared compound water pt.	758	85
Private connection	21	2

Data on dry waste (garbage) disposal

Site	No. of houses	%
River	603	67
Skip	162	18
Truck	130	15

This case study is an attempt to show how a conventional sewerage system can be implemented and maintained in highly congested and low income communities. It is an effort to identify the needs of such a community and aim at making the solution effective and affordable. This is in effect appropriate in that it was socially and environmentally acceptable and rendered an effective service to the community with a reasonable cost.

[1] A collection of a group of 'Kebeles'.

[2] The smallest administrative unit under the city council.

More than 50% of the community members earn their income from malted grain production which is then sold in Merkato, a large open market nearby, for the eventual production of " Tela " a mild alcholic drink.

In the production of malted grain or "bikil", as it is locally called, from wheat or barley a large amount of water is used, and hence a substantial amount of liquid wastes.

The grain to be malted is soaked in water for 24 hours and then the next day taken out and thoroughly rinsed. Following this, the grain is taken out and then spread over a plastic mat with an average thickness of about 20cms and pressed with rounded stones. This creates the ideal conditions necessary to make the moist grain germinate. Five days later, the grain in a form of lumps is taken out and broken into smaller pieces and laid out on the ground to dry and later on sold.

The whole process needs a substantial amount of water and land to dry the malted grain. However, because of the haphazard dumping of waste water, the few open spaces left in the kebele is turned into an open drain, unusable as a malted grain drying space. Alternatively, the community members involved in such activity used the asphalt roads for drying the malted grain with evident traffic problems. Moreover, drainage facilities for disposing the waste water were almost none existent except for a 400 meter long open channel which barely functioned due to garbage tipping into it.

In this particular circumstance, the technical challenge has been the provision of:-

1. Adequate water supply - to cope with the demands malting grain.

2. Effective affordable liquid waste drainage system.

3. Appropriate, low cost and clean pavement work for drying malted grain.

4. Appropriate garbage disposal system so that the drain could be protected against blockage.

These four tasks were interrelated in that if there is an adequate water supply, then an adequate waste disposal system is needed and if the waste disposal system is to be effective, then it has to be affordable and safe against the risk of blocking by garbage.

This effort was then a matter of balancing the various factors. In the first problem, the provision of an adequate water supply to 115 families was successfully completed with the cooperation of the Addis Ababa Water Supply and Sewerage Authority (AAWSSA). The costs for this were covered by the subsidy of OXFAM and contributions from families involved.

The second problem of inadequate drainage facilities was rather complex. The main issue was addressing the drainage needs while at the same time guaranteeing that it stays unblocked due to the largely uncollected garbage in the area.

The evaluation then centered on the selection of readily available options of sewage disposal, that is whether to provide open channel or cement pipe drain systems. On examining the open drains in the kebele, the following was observed:-

1. The open drains were made of stones with the rough surfaces at the joints hindering the smooth flow of wastes. Increased sullage retention, odor nuisance and exposed wastes posing serious health hazards were also observed.

2. Cleaning was difficult and took time because of the rough drain surfaces. Shovelling which is the standard form of cleaning was not very effective.

3. Increased garbage tipping into the open channel occurred due to the largely uncollected dry waste.

4. During the rather infrequent cleaning operations, the garbage taken out of the open drains is simply piled at the edge and left there, later on finding it's way back into the drains. The community members could not be regularly available to clean drains because of their daily bread earning activity which takes much of their time.

5. Increased grass growth at the edges of drains made periodic cleaning difficult.

These difficulties then pointed to the options of using cement pipes for sewerage. Initially, it may seem that without a sufficient and reliable water supply, a self cleansing velocity may not be maintained in the pipes and hence making the choice less appropriate; but this was offset by the high water consumption for the malted grain

processing which was the main stay of the community; and which provided a good self cleaning velocity inside pipes.

In general, the advantages of the closed pipe drains were:-

1. Sanitary disposal of domestic liquid wastes.

2. Availability of extra land for various activities including for drying malted grain.

3. Reduced cleaning frequencies and hence no extra burden on the beneficiaries.

Nevertheless, these advantages could only be realized if and only if the pipe drain system could be protected against blockage by garbage. In case such danger occurred, an adequate cleaning mechanisms should be available.

In the course of the project life, the pipe drainage system of liquid waste disposal was chosen and actual construction work proceeded, by installing cement pipes of diameter 100cm, 80cm, 60cm and 50cm to a total length of 2500 meters. The funds needed for this construction was mainly covered by OXFAM with some contribution from the community.

As a measure of protection in the event of blockage, manholes of size 65 x 65cm were installed every 20 meters with small inlets through which the community could pour domestic sewage. The close spacing of the manholes has an advantage by reducing the total length of pipe drains to be cleaned manually to 10 meters.

Additionally, to reduce the probability of blocking of pipe drains due to garbage tipping, garbage colleeting bins made of half barrels with handles were distributed to 194 families. It was assumed that such size of barrels have adequate volume to last at least till the municipality garbage truck comes for its periodic collection and that the beneficiaries would not be tempted to dump garbage into manholes.

To this end, a thorough and repetitive educational program was held with the community members, focusing on the handling and disposing of garbage and the appropriate use and maintenance of drains.

In spite of all these efforts, an unexpected thing happened. The drains were not well kept as anticipated and the beneficiaries opened the manhole covers and dumped garbages into the pipes. The garbage bins which were brand new and too big to be carried by two people when full, ended up as water storage containers for the malted grain processing activity. In their place, the community members used old buckets and bamboo baskets for garbage storage.

This showed that the real need of the community was not addressed. The necessity of devising alternative means of dealing with the shortcomings in the original proposal was apparent.

In due course, the following modifications were incorporated and a very satisfactory result obtained.

1. Manhole covers were replaced with very heavy and large size concrete slabs making it very difficult to lift and dump garbage inside the pipes. Narrow openings, too small to push garbage into the pipes but adequate for storm water flow were also provided at the sides of the manholes.

2. The community was encouraged to buy pipes of diameter 15cm at the then current cost of 15 birr/piece so that these small pipes which go right up to the doors of the beneficiaries and carry away the waste water of each family could be connected to the large sized pipes. Community members who could afford bought individually but those who couldn't formed groups (usually of 2-3 families) and had their "private connections " installed. These groups were voluntarily formed.

3 Grills were fixed at the tip of the small diameter pipes and the inlet smooth plastered with cement. Because of the small diameter of the pipe and the grill fixed at the inlet, garbage tipping was difficult and in fact since the cost of the pipes was covered by the beneficiaries, they protected them with real concern.

4 A large scale stone paving work was carried out in almost every open space available. This gave the previously garbage littered compounds a clean look which then influenced the beneficiaries to change garbage tipping habits. In stead of littering it everywhere, garbage was collected in small piles at

corners of houses, thereby leaving more open space for various activities. This work reclaimed previously unused areas and gave extra land for drying the malted grain.

5. Appropriate ways of garbage disposal and health education program was held.

6. Existing open drainage channels were rehabilitated by smooth plastering the channel surfaces so that sullage is not retained and in the event of cleaning no difficulty is encountered. Edges of drains were plastered for a width of 15cm to prevent grass growth.

Plate 1: Drainage problems in Kebele 29

Plate 2: Grass growth in open drains

This in effect was mobilizing the community resources and creating a strong sense of ownership and was in a sense "privatizing" the drainage system.

This system of "privatizing" the drainage network was so effective that the whole system worked with no maintenance for the last 5 years and is so doing even at the publication of this paper. The whole idea has been to provide an effective and appropriate form of sanitation to a relatively disadvantaged community right in the center of Addis Ababa.

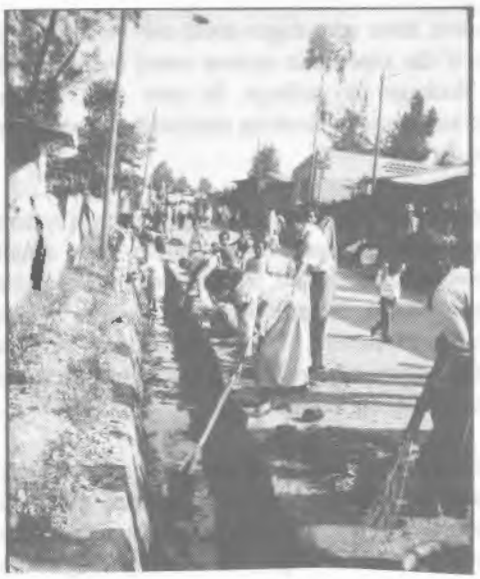

Plate 3: Cleaning open drains (Note the use of shovels & the pile of garbage at the edges)

Plate 4: Compound paving (Note the "bikil" production and the half barrel in the foreground)