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2005

Online at <https://mpra.ub.uni-muenchen.de/24258/>

MPRA Paper No. 24258, posted 12 Aug 2010 10:11 UTC

MUNICIPAL SOLID WASTE MANAGEMENT IN CITIES - ISSUES OF BASIC RIGHTS OF PEOPLE OF SURROUNDING A VILLAGE AND ALTERNATIVES

D Shyjan, R Mohan and V Surjit*

Abstract

The Study is based on the findings of a three weeklong field study conducted in Villappilsala, a village 14 kms away from Thriuvananthapuram City. The waste disposal plant for treating the Municipal Solid Waste generated in the Thiruvananthapuram City is located here. The study focuses on the health and environmental impacts of the functioning of the plant on the local community and addresses the larger question of necessity for scientific and cost effective alternative methods of waste disposal in the city itself. The disposal of Solid Waste has become a problem calling for more attention in the wake of urban development, which is the consequence of more people settling in the cities. The issue of decentralised and scientific disposal of Solid Waste at household level and at the level of small groups of households is emphasised. The central issue thrown up by this study is the poorer sections of the village folk bearing the brunt of the consequences of the profligate consumption and callous waste disposal habits of the upper classes in the cities

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1. Identifying the Magnitude and Dimensions of the Problem

Local authorities of almost all municipal corporations have been grappling with the problem of disposal of Municipal Solid Waste (MSW) in recent years. Increasing urbanisation, growing population and the consumption patterns of an emerging class of “*nouveau riche*” especially in cities have been contributing factors in exacerbating the already serious problem. Metropolitan cities are leaders in waste generation followed by other cities and towns. Capital of Kerala, Thiruvananthapuram, though not a metropolitan city, is witnessing garbage packed in plastic bags all street corners, especially near the monstrous looking municipal bins¹ overflowing with putrefied waste.

The Trivandrum City Corporation authorities (1995-2000) embarked upon a plan to convert organic waste into bio-fertiliser with private sector participation (POABS group), under the Build-Operate-Transfer (BOT) scheme, utilizing technology supplied by the Excel industries, Mumbai. The plant is located in Villappilsala, a Grama panchayat, situated 14 Kms away from the city, inhabited mostly by poor people who are casual labourers and marginal farmers cultivating own land. The Thiruvananthapuram Corporation acquired the land in 1993 in Nedumkuzhi in Chevollar ward in Villappil Grama panchayat. Ever since the idea of locating the waste treatment plant there was mooted, there have been strident protests from the local people and they formed a joint action council to agitate for the closure of the plant. According to Shri. Stephenson, elected representative of Chevollar ward and chairman of the welfare standing committee of Villappil Grama panchayat, “*Villappilsala is a place with natural beauty and the local people live in perfect harmony with nature and they are not enslaved to the use and throw consumption patterns of the rich in the city. Now with the commencement of the operation of the plant, the environment is polluted due to the arrival of garbage from the city and fresh water aquifers are contaminated due to dumping of inorganic waste which cannot be treated using the technology available.*”

In the decade of 1990s’, the pattern of residential construction in Thiruvananthapuram city underwent a rapid transformation as evidenced by mushrooming of flats. However, this trend atrophied with the slump in the real estate market in the latter half of 1990s’. The Pepsi, Coke, Mineral water dominated consumption patterns spread infectiously.

Plastic bags became the dominant packing material replacing covers made of old newspapers tied with coir (traditional industry in Kerala which is facing crisis). This change resulted not

¹ Of late these buns have been removed by the city Corporation.

only in increasing quantities of municipal solid waste coming to the streets but also in increasing proportion of non-biodegradable inorganic waste in the solid waste. It is a fact that the quantity of waste generated is going up due to the process of shortening of life cycle of products as a part of the capitalist motive of profit accumulation. New advertisements introducing new products with minor upgradations in short cycles of time makes useful assets redundant in a short span of time and it appears as waste (Strange, 2000). Many of the city dwellers resorted to mindless throwing of solid waste packaged in plastic bags in the streets. Though there are laws providing for prosecuting persons doing this, there has hardly been any effort, to implement this at the cutting edge level. It is an enigma wrapped in a riddle as to how such literate people who ought to be aware of the long term environmental degradation and health problems caused by garbage heaps in street corners of residential localities can do this. Equally astonishing is the fact that the local authorities have not made any attempt to begin a campaign on the need for segregation and source reduction of waste. After a quick round of the city, anyone would agree with the view that there could be no gainsay about the abysmally low level of environmental awareness of the 'literate' and 'enlightened' citizens in the city.

Given this background of magnitude and dimensions of the problem of solid waste management in Thiruvananthapuram city, we make an attempt here to analyse the result of the initiative taken by the Thiruvananthapuram Corporation to abate this problem by starting a bio-fertiliser factory at Villappilsala². Specifically we address three important issues viz.;

- 1) What is the impact of this on the local community of Villappilsala?
- 2) The question of making the village folk, whose lifestyle is much more environmental-friendly, bear the brunt of the harmful impact of waste disposal of the cities; and
- 3) Has the opening of the plant helped to reduce the problem of waste disposal in Thiruvananthapuram city: the possible reasons and suggestions?

2. IMPACT ON LOCAL COMMUNITY

There were promises that no environmental and health problems would be caused due to the functioning of the plant and adequate care and precautions would be taken. Ever since the factory started functioning, there have been reports that it has been causing environmental and health problems to the local community. The Joint Action Council of the local people has been agitating continuously demanding closure of the plant. To get a feel of the ground reality, a

field study has been conducted in Villappilsala in December 2001. The methods of study were collecting information from households in the immediate vicinity of the plant, interviews with key persons in the locality, meeting with local groups like women's self help group and CSI church, data collection from primary health centers and focus group discussions with the elected representatives of the Grama Panchayat and discussion with an environmental activist Dr. Satish Chandran, who had worked in that area³. The study brought forth certain hazardous problems faced by the local community which are discussed in four heads viz., water contamination, health issues, problem of insect vectors and other issues.

a) Water Contamination

The local people are complaining that the dumping of waste in the factory site is polluting the ground water in places of lower elevation. Clause 2.1(d) of the agreement between the POABS group and the Thiruvananthapuram City Corporation states:

“Dumping Site’ (As per Annexure B) nearby to the plant ‘site’, POABS shall be entitled to appropriately use the demised land for dumping the ‘Process Remnants’ if any, in respect of which no levy, cess, taxes, charges of any nature what so ever shall be payable by POABS to Thiruvananthapuram Municipality Corporation. However, the cost of transport from Celrich Plant as well as labour cost for loading and unloading such Remnants to the said dumping site shall be borne by POABS.”

Remnants are mostly the inorganic non-biodegradable waste. This is increasing in proportion and its dumping in the site causes oozing of water content that is polluting the fresh water aquifer, *Meenampalli thodu* at its source. The dumping site is situated at an elevated place. From our discussions with the Panchayat representatives and officials of the Primary Health Centre, we could reliably understand that the water samples from the wells in some of the houses were tested by the water analyst of the government and the finding was that the well water has been polluted and is not potable. During the household visits, people told us that they once used to drink water and take bath in the aquifer⁴. Later, cattle had died after drinking

² See Appendix 2 for a description of the technology of waste processing in the plant at Villappilsala.

³ A detailed description of the research methodology used in the present study is reported in the Appendix.1

⁴ This study was conducted in December 2001, the first survey report prepared in February 2002 and the earlier version of this paper was presented in January 2004. There have been important developments since. The drinking water supply to the Thiruvananthapuram city from certain pumping stations had to be stopped in the month of April 2005 due to the dumping of the unprocessed waste near the water source.

water from that. One youth showed wounds all over his body and complained that he got them after taking bath in the aquifer.

The agreement clause 2.1(d) cited above permits the plant management to dump inorganic waste instead of doing the scientific method of Sanitary Land Filling (SLF)⁵, which requires the remnants to be reduced to the smallest practical volume and covered with a layer of earth at frequent intervals⁶. Surprisingly, the corporation has gifted away on a platter its right to levy any penalty, cess or tax for environmental despoiling consequential to dumping, while failing to extract any assurance from the plant management on environmental protection. The officials of the State Pollution Control Board who conducted a spot enquiry in the presence of local people, had found that the contaminated water from the factory site was coming out and polluting the water sources in the neighbourhood.

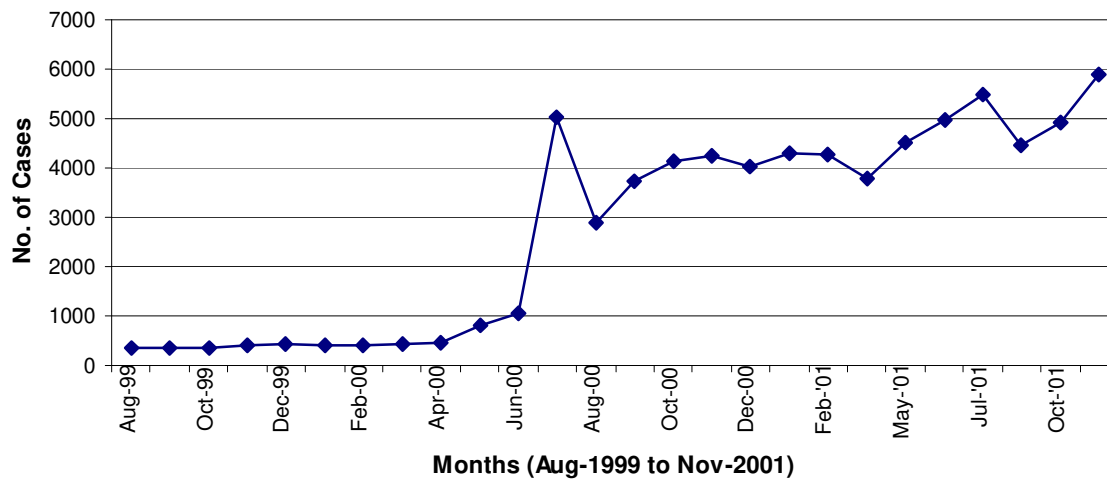
b) Health Issues: (Un)Clean Air to Breathe

The garbage is brought to the factory from the dumping yards of the corporation in the city after elapse of some time and is heaped in the outer circle of the plant for seven days, causing emanation of intense stench from the garbage. It also spills over to the road while being transported in open lorries. Moreover, birds and dogs quite often collect garbage from the dumping site of the plant and drops in the house premises and even inside wells. All these cause health problems to the members of the local community, especially respiratory problems. From the month wise data collected from the Villappil Primary Health Centre (PHC), for the period from August 1999 to November 2001, it was seen that there has been a marked increase in the incidence of acute respiratory illness in Villappil since June 2000 when the factory started is operation (Figure 1).

⁵ This issue has come into focus recently (April 2005) and city corporation is attempting to take initiatives in this regard.

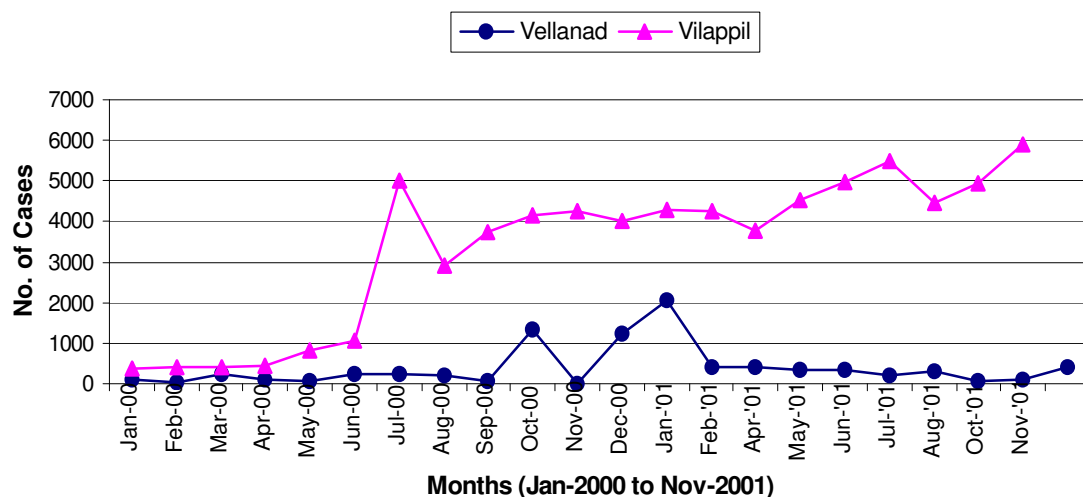
⁶ An alternative to landfills which will solve the problem of leaching to some extent, is a sanitary landfill which is more hygienic and built in a methodical manner. These are lined with materials that are impermeable such as plastics and clay, and are also built over impermeable soil. Constructing sanitary landfills is very costly and they have their own problems. Some authorities claim that often the plastic liner develops cracks as it reacts with various chemical solvents present in the waste. The rate of decomposition in sanitary landfills is also extremely variable. This can be due to the fact that less oxygen is available as the garbage is compressed very tightly. It has also been observed that some biodegradable materials do not decompose in a landfill. Another major problem is the development of methane gas, which occurs when little oxygen is present, i.e. during anaerobic decomposition. In some countries, the methane being produced from sanitary landfills is tapped and sold as fuel. ("What is solid waste" www.epa.gov)

Figure.1
**Month-wise Total Number of Acute Respiratory Illness Cases Reported in Villappilsala
 PHC from August 1999 to November 2001**



The incidence of Acute Respiratory illness among the Villappilsala people show sustained increase since the factory started functioning. The total number of respiratory cases reported in Villappil PHC has increased from 341 in August 1999 to 5895 in November 2001 (about 1600 percent increase!). Further, we see that the number of respiratory cases reported in Villappil PHC is very high when compared to that in a neighbouring Community Health Centre (CHC) at Vellanad for the period from January 2000 to November 2001 (Figure 2).⁷

Figure.2
**Month-wise Total Number of Acute Respiratory Illness Cases Reported in Villappilsala
 PHC and Vellanad CHC from January 2000 to November 2001**



It is shown that the number of respiratory cases was more or less similar between Villappil and Vellanad Health Centres before the functioning of the factory in June 2000. But the former

⁷ The data on respiratory illness in Vellanad CHC are available only from January 2000.

started to show much higher number of cases than that of the latter with the launching of the factory.

Almost every household had reported cases of respiratory illness since the factory had started functioning. Some of the people complained that plastic, tyre etc. is being incinerated inside the compound of the factory and this leads to intense smell that is extremely harmful. The stench emanating from the putrefied garbage causes nausea and loss of appetite among local people. According to Father Kanakaraj, priest of the CSI church in the area, the aged are suffering mostly due to this. The smell from the garbage is intense because the waste coming in lorries has already been in the dumping yards in the city for a considerable time. In the following sub-sections, we attempt to record the views and emotions of the local people as nothing else can be a better substitute for assessing the impact of the plant on the local community.

c) Problem of Insect Vectors

When we were going to participate in a self-help group's meeting, one person stopped us and invited to his house to see the swarm of flies in front of his house. He is a casual labourer and his family consists of 5 members. He has two daughters and one was married off the week before. Last month he was admitted in Villappilsala PHC for 5 days with respiratory problems. His wife and daughters are also having the problem. There is problem of flies and he lamented that the people who had come for the marriage left without eating. When we went there we saw the front room and the small yard of his house full of flies and we could experience what local people were talking about. The time was 5:45 P.M. and it was impossible even to think of having a glass of water, leave alone eating food. Not a bit of what we had heard was exaggerated, if we were to go by this experience. On a different day at 12 Noon we visited the house of David. His family consists of his wife, two children and himself. He was showing a large number sitting on his cow, despite applying neem oil. He showed us the large number of flies on the clothes that were spread for drying. Scores of flies were there sitting on the bowl attached to the rubber tree. Local people are finding it difficult to eat food and worst plight is that of women trying to give food to small children who keep running around the house. They use one hand for holding the plate and the other for driving away the swarm of flies. The question that bothers then is how to feed the children? Though there is not much problem inside the factory, due spraying of medicine, there is no abatement to the problem of flies in the neighbourhood of the plant. The presence of unusually large number of flies can most probably be due to the presence of the dumping site.

d) Other problems

On Sunday morning, we met local people numbering about 50 who came out of the CSI church after prayers. There was initial difficulty in establishing a dialogue. The local people are nowadays suspicious of outsiders and they consider all of them as, to say the least, unsympathetic to their cause. One or two gentlemen started talking and then we could interact meaningfully, with at least 10 men and 10 women.

There was some reluctance to disclose their names and we were not particular about that. Their fear was that even by openly talking, they would be booked under some 'false' cases. This obviously could have been out of experience. The feeling of the people was totally against the plant. They want it to go lock, stock and barrel. Deeper issues are involved and it is not merely environmental pollution and other negative externalities from the plant. In the framework of neoclassical economics, externalities occur when one person's consumption affects the preferences of the other. The city dwellers' profligate habits of waste disposal have resulted in the 'necessity' for this plant. Following this logic, the very existence of this plant in Villappilsala is a negative externality for the local people.

The self-respect of the citizens has been hurt. The people to whom we talked on Sunday morning were emotional and irate over the treatment meted out to them. To gloss over this feeling and concentrate on certain aspects of the plant generated externalities only, will amount to missing the wood for the trees. We discuss this issue separately in this paper

3. Village bearing the brunt of City's Waste Management: Local Views and Certain Larger Issues

a) A Summary of views expressed by local people

The local people feel slighted about the way they were treated - first they were told that a medicinal plant garden was going to be started, later, the district administration told that the land was being measured and no waste treatment plant would be started there. All expectations were belied when the construction of the plant was started under heavy police escort and it was then that the local people felt helpless and betrayed. It is through newspapers that they learnt about the real intention, i.e. starting of the waste disposal plant. They feel that their voice is not being heard with the attention it deserves because they are poor. They believe that feelings not indexed by money are not heard. They said that what was happening was something similar to what they have heard from history about colonisation. There is total lack of faith in the bureaucracy and the elected representatives and they are all seen as puppets of the factory

management. They were very vocal in stating that their right to be treated as equal citizens as the residents of the city was not being recognised. They are not able to eat food because of the swarming flies, nausea caused by the stench emanating from garbage movement and noise pollution. They feel their basic right to life is being questioned. There is seething anger towards city corporation officials, elected representatives and the police officials. They were very upset about some of the 'so called environmentalists' in not visiting the area even once despite being requested. They stated in anger that their books and poems should be boycotted. They are feeling that Villappilsala is being made the waste paper basket of the city. The members of the local community do not resort to throwing of waste on the streets, they asserted. They were also saying that had only persons belonging to a single religion or a community inhabited the place, the City Corporation or the government would not have dared to treat them like this. (So much said for the common man's perception of enlightened Kerala's 'secular' minded politicians.). The local people were also highly critical of the role played by the print and electronic media. According to them, the media have never bothered to report their views with the importance it deserved.

The local people complained that the Doordarshan, when it broadcasted the programme "Vivadaparvam", completely ignored the views expressed by them. They also stated that anybody, who wanted to understand the problems faced by them, should stay there for a few days. This suggestion is quite valid because the problems peak and ebb during different times in a day. The remark made by Shri. Stephenson, the elected representative of the Chevollar ward in which the factory is situated, is noteworthy: "*There are residents' associations within the city who should organize local level waste disposal. If the corporation feels that the plant causes no environmental problems, why it is not being relocated within the city.*" Initially the corporation authorities wanted to build quarters for the employees along with the bio fertiliser factory. That has never been talked about again. The local panchayat has refused to renew the license to the factory through a resolution passed unanimously. The panchayat president Smt. Sujatha Johny, an activist in the agitation against the plant says that if the state government has the political will the plant can be closed in no time.

b) Larger Issues to be Addressed

As already discussed, Villapilsala is a place inhabited by small farmers, casual labourers, and self-employed carrying on small time occupations. No single caste or religion is dominant in this Panchayat. The cross-section of the population, whom we met were very much perturbed over the location of the plant because they think that the city corporation authorities have

chosen this Panchayat as it is seen as the least costly political and economic route. They feel hurt in not being treated as equal citizens in a democracy. The first reason for the anger is the creation of deliberate information asymmetry regarding the location of the plant there. Second is the ignoring of their protest by the civil society. City's waste disposal is considered a larger problem than their right for a healthy and peaceful life. The rising health expenditure is upsetting their already hamstrung family budgets. Still transporting waste out of the city continues. A clean city where comparatively richer sections live is sought to be achieved at the cost of misery to the village inhabitants. This is very much similar to the dumping of hazardous waste including computer waste by the rich countries of the north to the poorer countries. More puzzling is the all Kerala trend in solid waste disposal. Villapilsala is not an isolated example. The same has been happening in Kozhikode and Kannur and there have been strident protests from the village people and social activists. This raises a few important issues: i) The state, whether at the national, provincial or the local level, is subordinate to the concerns and interests of the better-off sections whose power of articulating their problems is stronger than the poor who are unorganised, ii) The indifference of the political organisations cut across ideological spectrum in recognising the problem of the village people, iii) The abysmal level of environmental consciousness of the educated citizens and iv) The dumping of urban waste in villages becoming a pattern in Kerala which has been acknowledged as a model in health, education and decentraliation. The question of governance, i.e. finding out feasible mechanisms for source reduction of waste and propagating them, implementing the required safeguards in running of the plant offer only partial solutions to the larger question. This is a kind of intrusion of the well-off⁸ by transporting their waste to the habitat of the villagers and thereby denying the latter clean water to drink and clean air to breathe. What is more dangerous is the lack of desired empathy with the problems of the affected people. The problem gets attention only when the transportation of waste from the city gets dislocated or when water supply to the city is disturbed. The day-to-day travails of the affected villagers are considered to be far less important. The fact that this is happening in a State like Kerala, which is internationally acknowledged for egalitarian reforms and organised fight for democratic rights and State provisioning of basic needs is puzzling and what is more intriguing is the lack of political leadership to the local people, who can only attempt, most of the time vainly to make their voices heard. In a State where many alternatives have been experimented, a more people friendly waste management needs to be tried and this is possible only by the city

⁸ The quantum of Municipal Waste generated by the urban slum could be argued as lesser than the well-off by virtue of the smaller proportion of the former in city population.

population empathising with the village people. The fact which clearly emerges is that the functioning of the plant has caused environmental and health problems for the local community and it is time to think of other alternatives for disposal of Municipal Solid Waste management in Thiruvananthapuram city.

4. Is there reduction in garbage littered in the city? Reasons and Suggestions

a) Impasse over the Functioning of the Plant

Even after the plant has been started, the streets of Thiruvananthapuram continue to be littered with waste packed in plastic bags. Though operational problems like lack of vehicles and security problem due to agitation by local people by Villappilsala are being cited as the reasons by the city corporation authorities, the root of the problem lies in lack of awareness and the will to segregate and reduce waste at source. This basic problem craves for attention, but does not get it, even after the first ever Build Operate and Transfer (BOT) agreement between the corporation and the private sector group has run into rough weather time and again. The plant authorities want assurance from the corporation that the bio-fertiliser manufactured there should be assured of a market and the corporation is in turn looking up to the government to lend a helping hand.

The inability of the City Corporation to supply 300 tonnes of garbage per day has also been a bone of contention between the plant and municipal authorities. This clause has come in for severe indictment by the State Assembly Committee on Environment. In the last one-and-a-half years, the plant authorities have resorted to closure of the plant on more than one occasion and each time the city corporation and the state government gives them assurance on marketing outlets and quantity of garbage to be supplied, to end the stalemate, albeit temporarily. The latest development is that the Thiruvananthapuram District Panchayat agreed to purchase the bio-fertiliser manufactured by the plant. But some Panchayats including the Villappil Panchayat has expressed unwillingness to purchase this manure, according to an elected representative in the Panchayat. The plant is not functioning regularly for the past six months due to the lack of profitable marketing options for the fertiliser. Though the local people heave a sigh a relief that lorry loads of garbage are not driven into their peaceful hamlet, the Damocles Sword of reopening of the factory is hanging over the local community. The Villappil Panchayat's President, whom we met again when we revisited the area after an interregnum of one-year, was of the opinion that the local people's problems was not of any concern to the bureaucrats as well as elected leaders, who more than once pressurised her to renew the license to the plant. The non-functioning of the plant at least for the time being, due

to the demands of the management for an assured market for the fertiliser has come as an unexpected boon to the local community. In the meanwhile, the dumping yards, with residential houses in the vicinity in the city are overflowing with garbage and this has led to protest from the residents' associations.

We also think that it is pertinent to raise the issue of private participation in a basic civic function like waste management. In view of this increasing magnitude of the problem, private initiatives are considered advisable. But the experience of Thiruvananthapuram shows that the government has to ensure market for the product of the waste management plant, agree to stringent conditions of compensation for non-delivery of requisite quantity of waste, and permit a free dumping of non-biodegradable waste causing pollution to water source. This is indeed a heavy price being paid. If the private partner claims compensation from the corporation for non-delivery of the specified quantity of waste per day, the amount to be paid @ Rs. 49900/- per day will at stratospheric levels compared to the resource base of the city corporation. The unfortunate aspect is that even when faced with such crises and pressure tactics from the BOT partner, the public authorities and even city residents fail to think of some simple, yet effective alternative mechanisms of garbage disposal, rather than treating the present mode of dumping it in Villappilsala or in some other place as a *fait accompli*.

b) A Few Suggestions for Alternative Methods of Waste Disposal

A series of research projects conducted by KRPLLD, from 1996 to 2004, on Solid Waste Management for different districts of Kerala came up with the following suggestions: a) composting and biomethanation for biodegradable waste, b) household level vermicomposting, c) experiments on windrow composting, adaptation, d) trench and heap composting. Nair and Sudhir (2005), while synthesising the KRPLLD studies, argue that in a sustainable waste management regime, the focus must be on resources rather than the waste. According to them the responsible approach would be to eliminate the generation of waste wherever possible and to use the resources continuously and equitably. The argument of source reduction presumes the participation and co-operation of the city dwellers. For that the City Corporation should think of ways to create awareness among the people. It should be recalled that the achievement of Surat as a model city in solid waste management was made possible by the full support and cooperation of the people. Dumping waste in a place outside the city without giving any thought to methods for source reduction will create more problems.

Thiruvananthapuram Corporation deals with the problem of disposal of municipal solid waste in a lackadaisical manner. The agreement entered into by the corporation with the POABS group to supply 300 tons of waste per day has apparently been made without any foresight and goes against the attempts to be made for source reduction. The corporation has not been able to supply more than 90 to 100 tons at any point of time and this has been averred in the affidavit filed by the State Pollution Control Board before the High Court of Kerala. It is to be seen that this agreement makes the corporation bound to supply a large amount of waste per day and pay compensation @Rs.49990 per day, if it fails to supply 300 tons of waste per day for a continuous period of ten days⁹.

Pay-As-You- Throw principle can be considered. This is being implemented in some cities of the United States of America (USA). The services of voluntary organisations and residents' associations can be utilised to employ persons to collect garbage from household and deposit them into the bins whose keys will be with these persons. The corporation can sell bags of different storage capacities for garbage filling. The rates for higher storage capacity bags should be progressively increased to encourage source reduction. It is imperative that garbage deposited in these bags only should be collected. The people should be requested to segregate biodegradable and non-biodegradable waste. This will encourage segregation and source reduction of waste. As a consequence a marked reduction in the quantity of Municipal Solid Waste generated is expected which will make possible decentralised composting of organic waste. The non-biodegradable waste that cannot be reused and recycled should be deposited in Sanitary Land Fills (SLF), causing least possible damage to environment. The initiative of the municipal authorities could also be that of facilitators in negotiating with industries in buying back used batteries and tube lights for safe disposal (see Appendix 3 for some examples of items that can be recycled or reused).

For the city to become clean and green, the efforts at segregation, source reduction, recycling solid waste has to be practiced by the city residents and the City Corporation should encourage and facilitate these efforts with the co-operation of voluntary organisations and residents'

⁹ We found during our visit to the dumping yard at Manacaud (a place within the city corporation limits just behind the market place), that waste including plastic and other materials was being incinerated. The dumping yard is just behind the Manacaud market and there are residential houses around it. This incineration releases toxic gases in the atmosphere and has extremely harmful effects. On the one hand, the corporation is becoming liable to pay compensation to the POABS group for not being able to supply the contracted amount of waste and on the other hand, the waste collected is being disposed of by incineration, which is most objectionable, instead of sending it to the factory as per the agreement. At times waste is being incinerated inside the municipal bins, placed in the street corners, causing release of toxic gases into the atmosphere. Small initiatives from citizens will also help in lightening the problem a lot.

associations. Dumping waste in Villappilsala will only result in making the villager who has been living in harmony with the nature, a victim of respiratory illness for no fault of his. Clean drinking water and right to breathe clean air of the residents of Villappilsala cannot be the price for a clean and green Thiruvananthapuram city. Alternative methods of waste disposal may require extra efforts. But cutting the corners to achieve the goal of clean city will have pernicious consequences, while the goal itself might remain a dream.

Appendix.1

Techniques of Data Collection

The technique of data collection we used in the present study was derived from both conventional as well as the unconventional research methodologies such as:

1) Interview at Household Level

For getting enough information about the problem regarding the plant, about 23 households around the plant boundary were interviewed with a checklist containing some areas of inquiry.

2) Discussions with Key Informant

Key informant was selected on the basis of few criteria, such as, the person should be from the area itself, he should be well versed with the existing situation and he should be able to give a balance point of view as a neutral person. Above all he could guide us with the information or can tell from where we can get the information (Michael. A. Agar, 1996). The main purpose here was to get proper overview of the situation. In the present study Mr.Stevenson, Chevvolloor ward member of Vilappil panchayat and Father Kankaraj of CSI church were taken as key informants. The father is there in the study area for the past four years and has good understanding of the problem. Moreover, he is found to be not affiliated to any interest group.

3) Meeting with Focus Group

Unlike earlier technique, here a section of villagers were studied. The focus group under study includes all the members of Vilappilsala panchayat. They were asked to respond to different problems.

4) Discussions with Resource Persons

Resource person is person who can help in understanding particular situations of the area and also will act as a facilitator in information collection. In our study, Dr.Satish Chandran (Environmentalist) and the Doctor and staff of Primary Health Centre, Vilappilsala were selected as resource persons.

5) **Discussion with RRA Groups**¹⁰

Here one homogeneous vocal group (self-help group) of the village and a group of people gathered in front of the CSI church of the area were studied. Here information was collected at the group level. The main focus here was on the reaction of group on the issues involved.

6) **Secondary Information from Health Centres**

It includes the official data as well as available literature on the subject. In our study information regarding the incidence of respiratory illness of the people in the study area were collected from Villapilsala Primary Health Centre. For comparing this with a controlled group, same data were also collected from a neighbouring Community Health Centre in Vellanad, a village about five Kilometres away from Vilappilsala. Besides all these source of information, the available literature as well as the newspapers were also consulted as secondary source of information.

Appendix 2

The Processing of Municipal Solid Waste in the Plant

The solid waste received in the plant is treated by aerobic composting. As soon as the solid waste arrives at the plant it is unloaded on the treatment floor and spread out. An inoculum, which is a culture of different strains of bacteria, is sprayed on the solid waste and is laid to react with it. After that the solid waste is made into rectangular heaps. The treatment floor (it has a capacity to hold about 300 tons of waste, but presently they are treating on an average less than 150 tons of solid waste) is of circular dimension and the waste that arrives at the plant is heaped in a circular fashion. The fresh load of waste is heaped in the outer circle and is kept for seven days. After seven days the heap is turned inside to the next circle and again kept for seven days. Heaping the waste causes its temperature to rise to approximately 80 degree Celsius. The factory authorities claim that this would kill the harmful organisms, if any, in the waste. Each load of waste is turned in into four concentric circles with seven days period in each circle. This will take twenty-eight days and the load of waste is now ready for the process of sieving and grinding leading to the production of the bio - fertiliser. After completion of twenty-eight days, the waste load loaded into a revolving cylindrical sieve of mesh size 35-mm. Here large particles contained in the waste load including plastic bags, which has not decomposed and other materials are removed. The output from this sieve is again passed

¹⁰ RRA= Rapid Rural Appraisal. RRA groups here means groups that we quickly met and discussed without any prior information.

through a 16-mm sieve and lesser large particles are again separated. The material that comes out of the 16 mm sieve is grinded to fine particles and this forms the bio - fertilizer. Prima facie this appears to be a sound process, even though the nature of the inoculum is not revealed. A pertinent question, which arises at this juncture, is where does the refuse from the process go. This is dumped in a “Dumping Site” as per clause 2.1(d) of the agreement between the POABS group and the Thiruvananthapuram Municipal Corporation. The geographic location of the dumping site is such that the wastewater that oozes out of the sweat percolate to the fresh water aquifer at its source, and polluting the only fresh water source that the local community has. There are three serious issues of grave concern that arise out of the operation of the plant, which obviously cannot be answered by the technological process.

- 1) The stench that emanates out of nearly 150 tons of solid waste when it is turned in is carried by wind and this causes discomfort to the local community. Besides, birds carry the waste materials from the heap and deposit it in the premises where people live polluting their surroundings.¹¹
- 2) The heaps are turned in (mostly carried during night hours) using a pocklaine, which generates sound beyond one's tolerance level¹².
- 3) The refuse from the plant comprises mostly non-degradable plastic, which ultimately end up in the dumping site polluting the fresh water aquifer.

¹¹ The pollution control board team, which looked into the issue on High Court directive have made a mention of this and recommended that the open space between the floor and roof should be covered with nets to ward off birds. But this has not been done.

¹² Again the Pollution control board officials have observed that the sound proofing system of the generator of the plant doesn't confirm to the standards.

Appendix 3

Some items that can be recycled or reused

Paper	Old copies Old books Paper bags Newspapers Old greeting cards Cardboard box
Plastic	Containers Bottles Bags Sheets
Glass and ceramics	Bottles Plates Cup
Miscellaneous	Bowls Old cans Utensils Clothes Furniture

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