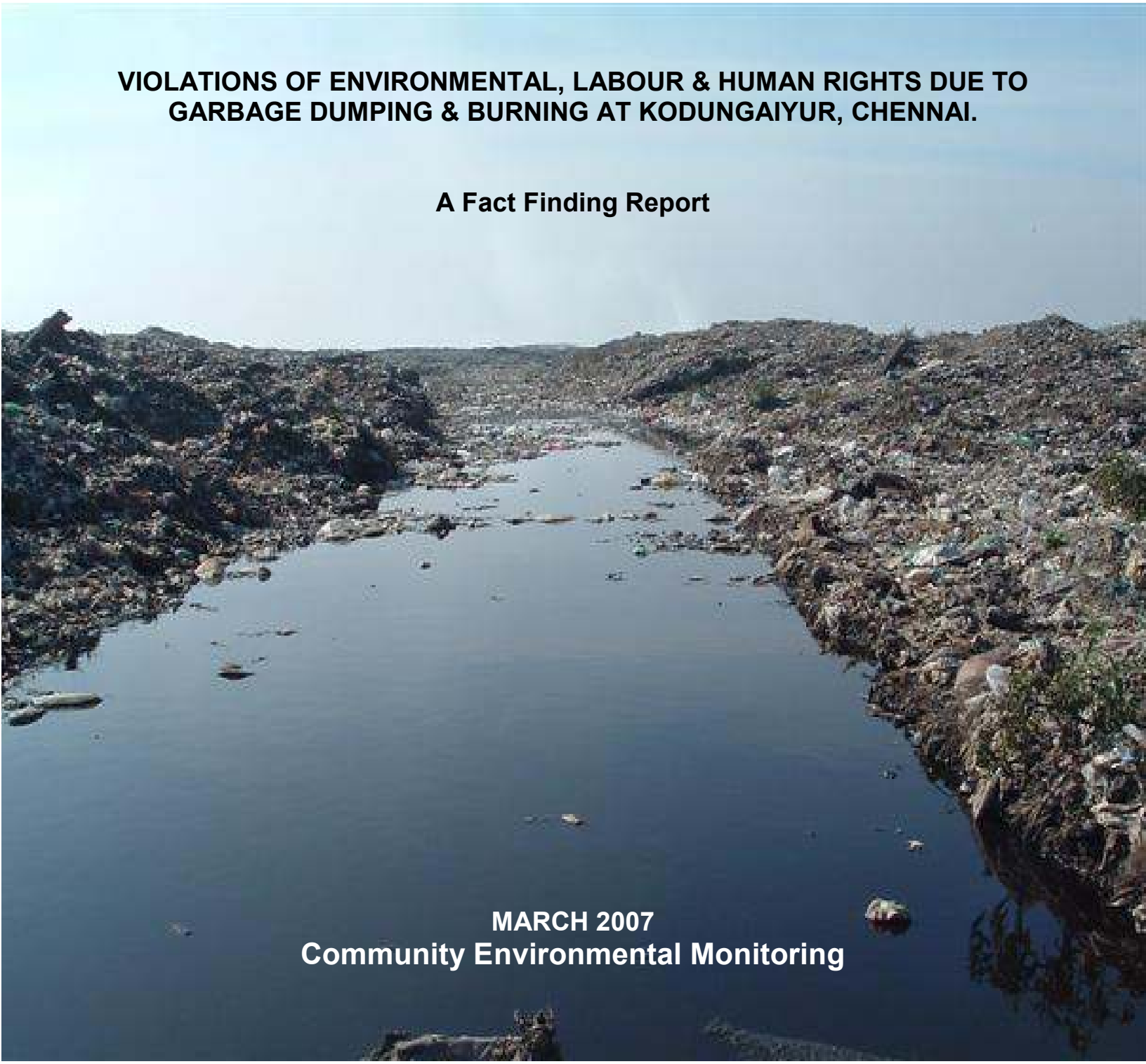
VIOLATIONS OF ENVIRONMENTAL, LABOUR & HUMAN RIGHTS DUE TO GARBAGE DUMPING & BURNING AT KODUNGAIYUR, CHENNAI.

A Fact Finding Report



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Community Environmental Monitoring

Acknowledgements

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Ever Vigilant Citizens Welfare Association
Residents of R.R Nagar, Ezhil Nagar and Panakara Nagar
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Executive Summary

The Kodungaiyur dumping yard, an unauthorized and illegal operation, is the largest municipal solid waste dump in the city of Chennai. From a small patch of land, the dump yard has grown rapidly over the last two decades, to the point where it now accommodates mixed garbage from 7 out of 10 corporation zones. Corporation records, however, maintain that only 5 zones send their garbage here. Tamilnadu Pollution Control Board records indicate that the yard is illegal, has no authorization for dumping from environmental regulators, and is in violation of the Municipal Solid Waste (Management & Handling) Rules, 2000.

The living conditions for residents living in the vicinity of the dump are miserable. The constantly smoldering garbage dump releases a shroud of toxic smoke that is blamed for the rampant health problems in the neighborhood. First in the line of fire from the dump are the waste pickers, who brave the smoke (and in many instances, cause the smoke by setting fire to the garbage) to scratch a living by recovering resources from the dump.

Local residents are frustrated that years of petitioning, protesting and meeting politicians and officials have brought no respite. In July 2006, representatives of Kaviarasu Kannadasan Nagar Citizens Welfare Association and Ever Vigilant Citizens Welfare Association from Kodungaiyur approached Community Environmental Monitoring (CEM) for assistance. On 23rd August, 2006, an air sample was taken inside the dumping ground that revealed the presence of 9 toxic chemicals including 3 carcinogens. The results were released to the communities, authorities and the press on 18 December, 2006. The shocking findings of the sample and the lack of any remedial action by the authorities prompted the residents to approach CEM to constitute a Fact Finding Team comprising eminent citizens with expertise in relevant fields.

A fact-finding panel was constituted including Dr. C.N. Deivanayagam, president of the Health India Foundation and former Director of Hospital for Thoracic Medicine, Tambaram; Ms. R. Geeta, all-India secretary of Nirman Mazdoor Panchayat Sangam; Dr. Karen Coelho, an urban anthropologist and Assistant Professor at the Madras Institute of Development Studies; Dr. Suchitra Ramkumar, a medical doctor and teacher from The School (Krishnamurthy Foundation of India); Dr. M. Thangaraj, professor and head of the Dr. Ambedkar Centre for Economic Studies, University of Madras, and Mr. Mohammed Nazir and Mr. Santhu from Chintan Environmental Research and Action Group, Delhi.

The fact-finding team was given the task of speaking to various interest groups -- residents, waste pickers, scrap merchants and government agencies like Pollution Control Board and Corporation of Chennai. The fact-finding team was given a brief to discover facts regarding the illegality and complaints regarding the ongoing dumping, and to evolve a socially just, environmentally safe and economically viable solution. Recommendations were sought for protecting the environment and health of local residents, even while ensuring that vulnerable communities such as waste pickers were incorporated into the solution rather than be victimized by the proposed solutions.

On the 22nd of January 2007 the panel held street-corner meetings with residents at Rajarathinam Nagar, Krishnamurthy Nagar, Kaviarasu Kannadasan Nagar, and Ezhil Nagar. The panel also visited the Kodungaiyur dumping ground, walked through affected communities, visited scrap merchants, met one group of waste pickers (predominantly women) near the dumping ground gates, and interacted with waste pickers at the Kodungaiyur dumping ground. On the same day, an air sample was taken in the presence of the panel. Despite invitations being sent to the Corporation and the Tamilnadu Pollution Control Board, no representative was present from whom the panel could seek clarifications.

Findings

The living conditions around the Kodungaiyur dumping grounds are deplorable. Residents and waste pickers agreed that the pollution from the smoldering garbage posed a serious health threat. The panel too is convinced that the garbage dump presents a clear, ongoing and present danger to the environment and residents. Residents were vehement in calling for an immediate cessation of burning, and for a ban on dumping in the near-term. Waste pickers were concerned about their livelihoods, and were interested in exploring solutions that protected their livelihoods even while improving the conditions of work. At least 7000 people are part of a multi-crore economy that recovers resources – such as plastics, metals, glass – from the garbage dump.

A population of at least a 100,000 in the immediate vicinity of the dump is exposed to the pollution from the garbage dump. It is clear that the Corporation has applied no criteria beyond convenience in locating the garbage dump in Kodungaiyur. The dump, it's siting, the ongoing dumping of mixed garbage and the burning of the garbage are all in violation of established norms and laws of the land.

The dump has come up in the vicinity of established residential areas, some developed by the Tamilnadu Housing Board. Other settlements such as the Slum Clearance Board tenements in Rajarathinam Nagar came up after the dumping began; oustees from slums and working class areas evicted to make way for Chennai's development were forced to relocate here, highlighting the callous indifference of the State towards the poor. The living conditions – sanitation and hygiene – in R.R. Nagar and Ezhil Nagar are of serious concern. Open drains, sewage inside houses, cesspools and plastic-choked canals hemming in the residential areas from all sides make this a very dangerous place to live, especially for children who are vulnerable to contamination and infectious diseases.

Air quality in this area is particularly unhealthy. Results of two ambient air samples taken from the garbage dump indicate the presence of dangerous levels of toxic gases, including chemicals like benzene, acrylonitrile, 1-4 dichlorobenzene and chloromethane, all carcinogens. According to CEM, the sample taken in presence of the panel revealed 33 chemicals, more chemicals than in any of 22 samples taken all over Tamilnadu, including from proven toxic hotspots like Cuddalore. The continued dumping and burning even after the results of the first sample were revealed implicate the Corporation in the willful poisoning of communities.

We find that the Tamilnadu Pollution Control Board has failed miserably in fulfilling its mandate of preventing pollution. The Board has reduced itself to a mere paper pusher with no relevance to the well-being of society and the environment.

The roads along the garbage dump are also used as dumpsites for both industrial and medical wastes. Within the dump, we witnessed pools of multi-coloured liquid leachates from the decaying garbage. It is inevitable that the groundwater in the vicinity is heavily contaminated with the poisons leaching out of the dump. We witnessed several burning mounds of garbage. Barring a gate and compound wall on one side of the dump, the entire site is unsecured, allowing access to all and sundry. We were told that lorry-loads of tyres and PVC wires were routinely burnt to recover embedded metal. Burning PVC plastic and mixed garbage releases dioxins and furans, some of the most deadly chemicals known to science. Both categories of chemicals are confirmed and among the most potent carcinogens.

Even worse, police and corporation officials react to complaints of pollution by harassing waste pickers rather than address the underlying problem of illegalities committed by the Corporation itself. Waste pickers and local residents alike say that it is the Corporation that burns the garbage or has it burnt to reduce volume and increase the space available for dumping.

Even as we as a society should attempt to move towards a lower consumption and zero waste lifestyle, we must ensure that the contribution of waste pickers to our society and the environment is recognized. New livelihood opportunities need to be presented to allow waste pickers to shift out of this occupation. Given the lucrative trade in material recovered from municipal garbage, any solution to Chennai's garbage crisis needs to ensure that waste pickers retain primary access to the garbage, even while their working conditions are drastically improved.

Another matter of serious concern is that the generators of the garbage being dumped in Kodungaiyur are oblivious to the problems created by their discards. The principle of Polluter Pays, which is an established principle in law, would require that households and commercial establishments that generate garbage take some responsibility for it, while companies whose products pose a disposal problem at the end of their lives, and local civic bodies shoulder the rest of the responsibilities. The Municipal Solid Waste Rules 2000 also place a legitimate responsibility on garbage generators, including households and commercial establishments, requiring them to segregate their garbage, it says "It shall be the responsibility of generator of wastes to avoid littering and ensure delivery of wastes in accordance with the collection and segregation system to be notified by the municipal authority."[1]

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[1] Source: Ministry of Environment and Forests.

It is no coincidence that the majority of the population living near the dump is poor. An overwhelming majority of those working in the garbage dump belong to scheduled castes and tribes. Even among the residents, working class and Dalit people constitute a clear majority.

We are painfully aware that as a repository of Chennai's garbage, the Kodungaiyur dumping ground presents a racist, casteist and discriminatory approach in garbage management, whereby the discards of the well-to-do from the city are dumped on a vulnerable community. Therefore, we are particularly mindful to insist that that any solutions presented to the Kodungaiyur problem should not victimize similarly vulnerable communities here or elsewhere.

The Fact-finding team recommends to the Corporation of Chennai as follows:

1. Burning of garbage should be stopped immediately.
2. Dumping of garbage at Kodungaiyur should be phased out in a time-bound manner, and the site should be rehabilitated to ensure that the buried wastes do not present an ongoing environmental and health threat in the future. Scrap merchants located within residential areas should be relocated to dedicated zones away from densely populated residential areas.
3. Diligently implement the MSW Rules 2000. Only segregated garbage should be collected by the Corporation. Each zone's garbage should be handled within the geographical confines of that zone, with decentralized composting yards and resource recovery stations.
4. Conduct an immediate survey of waste pickers and scrap merchants with a view to registering them, acknowledging their contribution and integrating them in the solutions to Chennai's garbage crisis. The current practice where unprotected workers handle the garbage under unprotected conditions must end. Waste pickers who want to change their profession should be offered livelihood training and options.
5. Promote neighborhood and ward-level garbage management employing existing waste pickers and improving their working conditions. Such a scheme would involve providing the waste pickers with source-segregated garbage, hygienic and convenient garbage-sorting areas for secondary-level segregation and recycling, and necessary safety equipment such as gloves, footwear and face masks.
6. Implement Extended Producer Responsibility schemes whereby items like tyres, batteries and fluorescent lamps are taken back for final treatment, recycling or disposal by the companies that make and sell them.
7. Conduct a widespread health and environmental survey to assess the existing damage and identify rehabilitation measures.
8. Arrange for underground sewage, well-maintained public toilets and basic amenities, including clean drinking water and a *balwadi* particularly for the residents of Rajarathinam Nagar.

Hydrogen Sulphide, Carbonyl Sulphide, Methyl Mercaptan, Carbon Disulphide, Methyl Ethyl Ketone, n-Hexane Benzene*, 4-Methyl-2-Pentanone, Toluene, 2 – Hexanone, Chlorobenzene, Ethylbenzene, m,p-Xylenes, Styrene, o-Xylene, n-Nonane, Cumene, Alpha Pinene, 4-Ehtyltoluene, 1,3,5-Trimethylbenzene, 1,2,4-Trimethylbenzene, 1,4-Dichlorobenzene*, 1,2-Dichlorobenzene, d-Limonene, Chloromethane*, 1,3-Butadiene*, Chloroethane, Ethanol, Acetonitrile, Acrolein, Acetone, Isopropyl Alcohol, Acrylonitrile*, Vinyl Acetate

* Carcinogen

The Panelists

Dr. C. N. Deivanayagam is the President of the Health India Foundation and the former director of the Hospital for Thoracic Medicine in Tambaram.

Ms. R. Geeta is the all-India secretary of Nirman Mazdoor Panchayat Sangam that works for the rights of unorganized workers.

Dr. Karen Coelho is an urban anthropologist and works as Assistant Professor at the Madras Institute of Development Studies. Her work focusses on the changing state and civil society formations in the context of reforms in urban governance.

Dr. Suchitra Ramkumar completed her degree in medicine and apprenticed with an Ayurvedic physician and a Homeopath before working as a Health Educator with the Association for the Physically Handicapped, Bangalore. She has traveled around India, working extensively with several different hospitals, NGOs and schools, before moving to Chennai in 1998. She now teaches Biology and Environmental Studies at The School KFI (Krishnamurthy Foundation of India) in Chennai.

Dr. M. Thangaraj is professor and head of the Dr. Ambedkar Center for Economic Studies at the University of Madras. He specializes in the field of Land Economics and Dalit Studies. He has also published an edited volume on the politics of land reforms in Tami Nadu.

Mr. Mohammed Nazir is a waste picker by profession and he represented the Chintan Environmental Research and Action Group, a Delhi based NGO addressing the issues of sustainable consumption and social equity. Chintan works towards improving consumption choices and practices that benefit both our health and environment and encourages practices that are sustainable and do not burden the poor.






The Kodungaiyur Dumping Ground

Geography

The Kodungaiyur dumping ground is part of a 400 acre marshland adjacent to the Kodungaiyur sewage treatment plant on the southern margins of flood prone alluvial lowlands of Korattalaiyar River. The dumping ground is surrounded by residential colonies on three sides and the Manali Petrochemical Estate on (the north) one side. Two open sewage channels called the Kodungaiyur Canal and the Captain Cotton Canal carrying city sewage and industrial effluents run through the residential locality and join the Buckingham Canal before emptying into the sea.

History and socio economic status

According to A. Pandurangan of Kaviarasu Kannadasan Nagar Citizens Welfare Association (KKNCWA), the Corporation of Chennai originally owned 741 acres of Kodungaiyur marshlands. Of this, about 289 acres was handed over to Metro Water when the latter was created. Of the remainder, only 50 acres was earmarked for Corporation's use. The remainder was to be handed over to Metrowater for undisclosed uses.[2] Clearly this has not happened and the garbage dump occupies more than 350 acres of the remaining area. Garbage dumping in Kodungaiyur began in 1989. Prior to that, the area was a cattle fodder farm. Kodungaiyur is an ecologically sensitive area. It is one of the few remaining natural marshlands in Chennai. Ironically, in a city that constantly complains of water shortage, the main civic agency can be blamed for destroying two of the most important freshwater wetland ecosystems – Kodungaiyur and Pallikaranai – by dumping of garbage.[3]

When dumping began, residential areas had already come up in the vicinity of the fodder farm. The settlements of Ezhil Nagar, Kannadasan Nagar and MKB Nagar predate the garbage dump by several years. MKB Nagar is 40 years old. The residents of the area belong to a variety of class backgrounds. Middle-class residents, mostly ex-government officials, constitute a major part of the residents that live in Tamilnadu Housing Board (TNHB) plots or areas officially allotted under government schemes in Kaviarasu Kannadasan Nagar, Krishnamurthy Nagar and MKB Nagar. Working class residents form the majority of those living in close proximity to the garbage dump. This section lives in pockets within middle-class neighborhoods, and in clusters such as the Slum Clearance Board buildings in Raja Rathinam Nagar, Ezhil Nagar, MGR Nagar, Panakara Nagar etc. The working class areas also have a high proportion of residents belonging to marginalized communities such as Scheduled Castes.

More than 100,000 people reside in the immediate surrounding areas including in Raja Ratinam Nagar, Krishnamurthy Nagar, Kaviarasu Kannadasan Nagar, Muth-thamizh Nagar, Ezhil Nagar, Netaji Nagar, Thiruvalluvar Nagar and MKB Nagar. The total population of the Kodungaiyur area is reported to be around 300,000.

Whose Problem is it?

Kodungaiyur is Chennai's problem. To keep the streets of Chennai clean, the Corporation has sacrificed the health and environment of more than 100,000 people in Kodungaiyur. The city of Chennai is divided into 10 Zones that generate a total of 3200 tonnes of garbage per day, according to the Chennai Corporation. Officially, the Kodungaiyur dump receives garbage from 5 of 10 Corporation zones including Tondiarpet, Basin Bridge, Pulianthope, Ayanavaram and Kilpauk.[4] Residents however assert that 7 zones send their garbage to Kodungaiyur making it the largest dumping site in the city.

All the garbage that is dumped inside Kodungaiyur is unsegregated. The yard is not a sanitary landfill. Garbage is dumped on unlined ground, and the site has been chosen without any regard to critical criteria such as proximity to residential areas and impacts on groundwater and people's health. Locals complain of garbage heaps that smoulder round-the-clock, stray animals especially dogs inside the dump, retarded development of

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[2] Information acquired by Mr. A Pandurangan through Right to Information Act from Metro Water

[3] Corporation of Chennai, Solid Waste Management - http://www.chennaicorporation.com/swm/swm2.htm. Checked on 27.2.2007

[4] Source: Corporation of Chennai www.chennaicorporation.com

the region in general, hazardous and biomedical waste dumping and overall neglect of the area. The basic infrastructure and the sanitation and sewage conditions are in a state of disrepair.

Residents are frustrated that very little can be done when a civic body of the Chennai Corporation's stature breaks the law and severely impacts people's health. Residents are keen to end burning and dumping in Kodungaiyur.

Since 2002, the Tamilnadu Pollution Control Board issued numerous show-cause notices to the Corporation for garbage burning. However, no follow-up action was taken indicating that the TNPCB's warnings were probably mere formalities done to protect themselves in the event of an enquiry into the illegalities. Curiously, not once has the TNPCB challenged the very legality of the Corporation's dumping on the unauthorized site, leave alone burning.

The Corporation blames the waste pickers for all the problems, especially burning. However, no effort has been made to stop burning, or even to effectively prohibit access to the dump. A compound wall erected on one side serves merely to hide the dump from view, while people and cattle enter at will on the remaining sides which are open. "The Corporation blamed the waste pickers for the menace, following which a wall was constructed to restrict the entry of unauthorized people into the ground, but the burning still continues and is probably worse than before," says KKNCWA's Pandurangan.

The main victims of pollution are residents, especially children in the immediate vicinity, and the waste pickers. "Upper respiratory tract diseases are the most prevalent among residents and the incidences of cancer are also on the rise," says P. Ganesan of the KKNCWA.

Local resident welfare groups like the Ever Vigilant Resident Welfare Association and Kaviarasu Kannadasan Nagar Citizens Welfare Association began the struggle against garbage dumping eight years ago. Recently many affected residents formed similar associations to challenge the garbage dumping. In February 2006, 32 local groups formed the Federation of North Chennai Residents Welfare Association in an attempt to amplify their protests.

Fact Finding team visit to Communities – 22 January 2007

Four main localities were selected based on the proximity to the dump and socio-economic diversity. Aspects including environment, livelihood, living conditions, health and economic growth were examined. .

About the localities visited

Rajarathinam Nagar also popularly known as RR Nagar was constructed in the early 1990s, with aid from the World Bank. Locals report that 1042 houses were constructed on a Lagoon that was connected to the waterways of Chennai. The lagoon was filled with construction debris and then constructed upon. An attempt was made to house conservancy workers (sweepers) from the Corporation in these houses. Owing to the poor living conditions, absence of basic facilities and proximity to the smoldering garbage dump, Corporation workers refused to move into these houses. Subsequently, from 1996, the Corporation and Slum Clearance Board began relocating people who were forcibly evicted from other parts of Chennai here. These included pavement-dwellers and slum dwellers evicted to make way for various "development" projects such as roads and railways.

Oustees that were relocated at Rajarathinam Nagar include:

- Royapuram residents (from Chettithottam) evicted to make way for Royapuram bridge
- Those evicted from Dental hospital
- From M.C. Road, Vannarapettai
- Kallarai Chalai (Cemetery road)
- Beggars from Chetpet who were evicted from Railway lands
- About 360 families ousted from Moolakothalam, near Basin Bridge
- About 38 Ceylon repatriates families

The location of a new housing colony next to an existing (illegal) garbage dump exposes the insensitivity of the planners. RR Nagar is a predominantly Dalit area.

Problems due to the dump

RR Nagar has more than 1500 households now, with a population of more than 7000. During our walk through the community, numerous women came out to present a litany of complaints. The women did not restrict their complaints to the garbage dump, but covered all relevant topics related to hygiene and sanitation.

Health

Residents complained that the air pollution from the garbage dump has severely affected local residents, especially children. Growth retardation, skin diseases, fits, fevers, perennial cough and cold were a few of the chronic ailments afflicting children. We repeatedly heard about high rates of absenteeism among school students owing to ill-health. Health impacts are likely to be more pronounced in this community because of the overall problems with hygiene and sanitation in the area, and the poor socio-economic (and therefore, nutritional) status of the residents.

Annailakshmi, a resident complained of constant illness, particularly respiratory ailments, among all members of her family. She said at least three children under 2 years of age in her area suffer from fits. Renuka, another resident and a mother, narrated an instance where her 2-year old daughter Ammu developed high fever after being bitten by mosquitoes, and had to be rushed to the hospital. Ammu appeared swollen all over. Renuka herself had large angry boils on her legs, which she claimed to have been experiencing on and off for about three years. Ajay, a 3-year old boy, had developed an infection in his ears. According to his mother Lalita, he fell ill often with fevers and cold, especially after he was bathed.

Civic

The Slum Clearance Board tenements have been developed without any regard to sanitation.
Open drains run close to the houses. Many houses are below the road level. As a result, sewage water percolates inside houses. We visited one house where the toilet inside the house was a cesspool of sewage and maggots seeping in from the open drains outside. During monsoons, the roads and houses get flooded. The ill-

designed drains are poorly maintained and choked by plastic trash. Drinking water tanks are located alongside and literally connected to open sewers; as a result, drinking water is contaminated.

Most houses are not big enough to hold toilets. Only 8 public toilets exist, but in such poor condition that even dogs and pigs avoid the place. Six of the eight toilets are in a state of advanced disrepair forcing many residents to visit the garbage dump for their morning ablutions. Residents recollected an incident where two children who had visited the yard for defecation were run over by a garbage truck that could not spot them due to poor visibility.

In several of the lanes in R.R. Nagar, the road had been raised over the course of 5-6 years to a height of over a meter above the thresholds of houses. Storm water drains had not been properly sloped causing houses to be flooded to several feet with drainage water during rains. Women were in despair over the filthy and unhygienic conditions in which they were forced to live. Flanking the Captain Cotton canal running behind R.R. Nagar is the Kodungaiyur crematorium, another source of smoke for the residents of the area. The Canal itself is a breeding area for mosquitoes and other vectors. Because the Canal is downstream of the garbage dump, it also seems to collect and transport highly toxic leachate from the dump.

One woman told the panel that the area had no Balwadi despite the fact that more than 7000 people resided there.

Many residents said they were involved in processing of garbage like bottles and metal clips. Shakuntala, one such worker, cleaned small balm and medicine bottles for her employer by soaking them in the water. She processes about 1000 bottles a day at her doorstep. Many similar household workshops were present throughout R.R. Nagar.

About 10 Self Help Groups operate in the colony. These are set up by Jeeva Jyoti, and are engaged in selling clothes, cooking powders, and tiffin boxes. They also run small saving schemes.

Demands

- Immediate cessation of burning
- Removal of garbage dump
- Livelihood rehabilitation and opportunities
- Maintenance and enhancement of public toilet facilities
- Open drains to be closed. Overhaul of household and street-level drainage.
- Toilets for each house
- Medical help and Balwadi for children

Krishnamurthy Nagar is one of the initial Government-approved layouts in the area that was allocated to individual buyers. The housing layout was approved in 1971 and first construction began in 1974. At the time, the area that is now dumped with garbage was grassy marshland and was referred to as "*Pull Pannai"* or fodder farm. Many Government and public sector employees purchased plots here and constructed pucca houses. The average resident here would fall in the lower middle to middle-income class. The sanitary conditions are far better than in R.R. Nagar.

Problems due to the dump

Among those who approached the panel members in the area, Kaveri, Mariambi, Rosali and Kesavan complained bitterly about the unbearable odours assailing them on a daily basis. They said the odours were strong enough to disrupt sleep. While pollution was present throughout the day, the intensity increased in the evenings, and was at its worst in early mornings. Visibility during the mornings and evenings was extremely poor, increasing the risk of traffic accidents.

Scrap merchants had set up storage and transfer godowns in what is clearly a residential area, thereby flouting all land-use norms. Many of the godowns store large quantities of inflammable items such as plastic scrap. A fire in any of the godowns could result in a serious disaster for the area's residents.

Residents also mentioned a plan by the Corporation to regularize the dump. The plan involves setting up a composting yard within the dump to handle a portion of the waste.

Health
The residents reported a range of health problems – frequent coughs, colds, sore throats, dust allergies, frequent vomiting and fevers. Children were once again identified as a particularly vulnerable category. One family had been forced to leave the area to protect its child's health. The residents report that the child was doing much better in the new locality. Residents here repeated the complaint about high rates of school absenteeism due to ill health.

All the houses were pucca and the vicinity was much cleaner compared to R. R. Nagar. There were no visible open drains and all houses had individual toilets.

Demands
- Removal of the dump yard - They feel that the value of their property has dropped drastically and relatives do not want to visit them.
- Removal of scrap merchants from the residential area.

Kaviarsu Kannadasan Nagar (KKD Nagar) is a residential colony similar to Krishnamurthy Nagar and in close proximity to the garbage dump. Allotted in the early 1980s to retired government employees, this area also consists of people belonging to middle income category. Among the 32 local groups including resident welfare association formed to counter the issue of garbage, Krishnamurthy Nagar and KKD Nagar have been in the forefront.

Problems due to the dump
Several residents including young women described how their homes were unlivable in the evenings. The smells were unbearable, the smoke was sometimes like a black cloud in the evenings that gave them headaches and they were unable to sleep at nights. Feral dogs from the dump that barked incessantly at night also interrupted their sleep. Residents also complained of health effects due to the smoke – sore throats and frequent colds were common especially among the children.

Civic
Residents reported instances of illicit dumping by private businesses on the edges of their neighborhood and outside the actual dump yard boundaries. "Trucks from local companies like the polishing and tanning industries nearby come and stealthily unload their garbage in the open spaces near our homes," said Sivasankari. The residents have complained to health authorities, but are yet to hear from them.

Along the Tondiarpet – Moolakadai highway stretching through both these communities a number of junk and scrap shops owned by individual traders and merchants also exist. These shops deal with everything from scrap metal, paper, plastic to medical waste. Many shops thrive on the pickings of the waste pickers. Others receive wastes in truckloads directly from the generators. "Many trucks sold scrap to merchants on the main road nearby, causing a huge traffic nuisance and congestion in the neighborhood," said a resident. Some lorries, including corporation trucks, stopped outside the dumpyard to allow scrap merchants to recover material before it is dumped inside. The increased truck movement and the parking of trucks at these illegal scrap yards increase the problem of vehicular pollution in the already overpolluted area.

Junk Dealers – medical waste recyclers
The panelists also visited 2 of the nearly 30 recycling units on the main road close to KKD Nagar. Contractors/ waste picker supply the material that is cleaned and then further processed in these shops before sent for recycling or re-use. The first shop was managed by women and the team had to wade through a pile of red, green and yellow coloured plastic bags to get in. The entire shop floor was filled with similar sheets and gunny sacks full of plastic bags were piled roof-high in the corners.

Upon enquiry and further investigation the team learnt that the bags were actually bio medical waste disposal bags, the colors represent the different kinds of waste that it holds. Red bags contained infectious wastes – the most dangerous component of the medical waste stream. All the women workers in this particular shed were slitting these bags without gloves, masks or shoes. Many of the bags were stained with blood, and the workers showed us used needles and sharps recovered from the bags. The women readily acknowledged that gloves

were a hindrance to working, and that injuries from the sharps hiding within the medical waste bags were common.

The bags we saw at the scrap dealer's shop carried the name of Sri Ramachandra Medical Centre, Chennai. The women said the bags changed several hands before coming to the scrap yard. They earned Rs. 50 a day and said that they did not suffer from any health problems due to their work. The owner was not available at the site.

The panel visited a second shop where about four workers were engaged in sorting medical waste. Syringes, IV tubes and IV bags and other plastics were piled in separate mounds. When questioned about her opinion about the garbage dump, the owner replied, "because of that dump, an entire *ooru* (village) gains a livelihood."

Local residents complained that the police refused to entertain complaints against the illegal scrap merchants because they received pay-offs from the merchants.

Demands

- Immediate cessation of burning
- Time-bound cessation of dumping.
- Relocation of scrap dealers

Ezhil Nagar is a residential colony on the banks of the Captain Cotton Canal. This canal is a branch of the Buckingham Canal. Around 6000 households are located in the area along the edge of the dump and the garbage-choked canal. Many of the households do not have formal pattas, leading to hesitancy among residents to exercise their fundamental rights for fear of reprisal from the authorities. Many residents of nearby MGR Nagar are also waste pickers. So the dump is both the source of income and a cause of health problems.

The residents here are predominantly poor. Many of the houses along the Canal are thatch houses in poor condition. A number of very agitated women waste pickers met the panelists with the complaint that they would do something else if opportunities were available. They felt victimized both by the garbage problem – where they are the first exposed to the pollution as waste pickers – and by proposed solutions that call for removal of the dump yard without considering their plight.

In Ezhil Nagar, those opposed to the dump live cheek-by-jowl with those that make a living from the dump. We witnessed one glass recovery unit where five women workers with surgical gloves and rubber chappals were engaged in separating metal filaments and components from discarded sodium vapour street lamps. In itself, this process of recovery was commendable and represents a tremendous service to the environment. Recycling of resources offsets the extraction of virgin resources from the earth. However, given the economic and environmental importance of the job performed by these women, it would help to ensure that their working conditions and remuneration are commensurate to the task they perform.

Problems due to the dump

Health

Several people in the area have chronic respiratory problems. One of the women residents, Vijayalakshmi complained that "my husband Lakshmanan, is unable to go to work for the past 8 years due to severe asthma is being treated at the Stanley Hospital. I spend thousands of rupees every year on medication and also got him admitted twice, but in vain." Children suffered from asthma and skin disorders and missed school regularly due to various health problems. Several of the women have had hysterectomies, recommended by doctors due to excessive pain and bleeding during menstruation.

Mosquito borne diseases were rampant here mainly due to the open sewers in the area.

Residents said that smoke from the dump also traveled to the school on the other side causing it to close down on many occasions.

Panakara Nagar

Very close to Ezhil Nagar across a small foot-bridge (close to the confluence of the Captain Cotton and Kodungaiyur Canal) a group of about 15 families live inside the dumping ground. Their houses are located across a pool of red coloured toxic leachate and a Murugan temple. All but one house is made of thatch and material scavenged from the dumpyard. Ironically and probably purposely named Panakara Nagar (Rich Man's Area), these households are located in among the most inhospitable places in Chennai.

The residents of Panakara Nagar, mostly waste pickers by profession, heard about the hearing and came to meet the panelists. Their problems were severe. Women claimed that children suffered from dizziness, asthma, skin diseases and frequent vomiting. Kamathchi Devi, who broke down while testifying said that they suffered because of everything, due to the dump and the burning and being in the profession of waste picking; they would also be the victims if the dump is closed without offering them livelihood options.

Most waste pickers were quick to dissociate themselves from those who burn the garbage. The burning was a result of fires set by organized gangs that brought in truck loads of lorry tyres or PVC wires, they said.

Waste Pickers

Waste pickers are divided into two groups: *pacchha kuppai* (wet garbage) collectors collect plastic, paper, cloth and other items from the fresh garbage; the *gaandha kuppai* pickers use magnets to extract iron and scavenge for other metals such as copper wire and aluminium. The *pacchha kuppai* collectors get the first shot at sorting through the contents of garbage trucks. Because they recover everything that is accessible from the surface, the *gaandha kuppai* collectors then have to resort to burning to get to the resources buried under the piles of fresh garbage.

According to this group, about 700 metal pickers, mostly women, made a livelihood from the dump. Taking into account the men and children who entered the dump to supplement their income, the number came to around 2000.

The residents said that there were many accidents in the dump yard – several people had died under the wheels of dump trucks, but they could not register any complaints because they were inside the dump illegally. They also faced a lot of harassment from Corporation Authorities and the police who blamed them for the burning, kept them in detention and made them pay huge fines. Residents and waste pickers were united in blaming corporation workers for the fires. The motivation, according to them, was that the Corporation got to reduce the volume of wastes by burning it, and thereby increasing the space available for dumping more wastes. From the ease with which we accessed the dump, and the absence of policing of the illegal dump by the Corporation, the claims of the locals seemed to have much merit.

Women, who constituted a majority of those who approached the panel, claimed that they were the sole wage earners for their families as their husbands were either drunkards or jobless. Amulu and Raku said that they were involved in this work from their childhood. "We pick waste from 8 am to 5 pm and earn about Rs.50 or 60/- a day. We are being chased out for the past 3 months. If this continues one member of each family will start to die. All destitute women here are dependent on this."

Demands

- Economic rehabilitation of those dependent on waste picking by either integrating them in any long-term solution to the garbage problem, or by providing alternative livelihoods.
- Organise waste pickers in associations or cooperatives so that they can gain from collective bargaining to protect their interests.

Other Places visited

Kodungaiyur Dumping Ground was the last in the list of places visited by the panelists. The panel walked across the bridge over Captain Cotton Canal, and through a pathway padded by medical wastes and surgical gloves. The air was thick with smoke. People, children, cattle roamed through the surreal landscape with wanton abandon. We learnt that the buffaloes that grazed here supplied milk to the neighborhood.

The panel was unable to stay for longer than 30 minutes in the dump. An air sample to measure the toxic gases in the ambient air was taken in the presence of the panel members. The sample was sent to US Environment

Protection Agency-certified Columbia Analytical Laboratories in California for analysis. The analysis revealed a total of 33 chemicals, including 5 carcinogens like Benzene 1680 times and 1,3-Butadiene 14348 times above safe levels respectively. *Please refer to the detailed report in Annexure 1.*

Meeting with *pacchai kuppai* pickers

A large group of these waste pickers had collected to meet us near R.R. Nagar weighbridge, clearly agitated over the prospect that the dump might be closed down or relocated. Most of the nearly 2000 *pacchai kuppai* pickers in the dumpsite, according to the group, were residents of R.R. Nagar. About 50 came from Athipet, Minjur and other parts of the city. Women constituted the majority of those present at the hearing. They said that they were sole wage earners and that their husbands were either drunkards or jobless. Some children were also engaged in the trade. The women claimed that waste picking was a traditional occupation that they had been engaged in since childhood. They worked from 8 am to 7 pm at the dump. They claimed that the harassment from Corporation officials had increased recently and that they had not been allowed to enter the dump in the past three months.

The women said working in the dump yard did not affect their health. “We have been doing this from childhood and we are fine. We are used to it. We even eat our meals inside the dump.” It was clear, though, that they were fighting to save their livelihoods. They demanded that they be given alternative jobs if the dump was closed down or moved. “We can sweep, we can do road-sweeping work, but other than that what can we do, we don’t have any other skills, we have been doing this work for generations!”

It was also clear from the meetings with both groups of waste pickers that there was a lot of conflict and competition over pickings from the dump and over the issue of burning and who was responsible.

Community Meeting at Mercury School

A final meeting with the organizers and other interested people took place at the Mercury Matriculation School in Mullai Nagar. At least 7 waste pickers from R.R. Nagar attended the meeting, as did a member of the local Communist Party of India (Marxist).

Mohammed Nazir, a waste picker from Delhi-based NGO Chintan and a panelist, introduced the groups to the working structure of his organization and the model promoted by his organization in Delhi. Chintan waste pickers trained residents to segregate garbage into dry (non-degradable) and wet (compostable) wastes. Waste pickers too were trained in handling garbage without creating pollution, and with a mind to their own safety and hygiene. Mr. Nazir also pointed out that there were numerous techniques to recover metal from encased material (such as wires or tyres) without having to burn them.

According to him, in New Delhi, Chintan identified waste pickers issued ID cards and introduced registered waste pickers to the local police, corporation and residents’ association representatives. Waste pickers with IDs would collect segregated garbage from households. Neighborhood sorting stations would be constructed with support from local philanthropists. Such stations would be used by waste pickers to sort through the non-degradable garbage. The compostables would be composted at local composting centers located within parks or other public spaces. Recoverables would be recovered and sold by the waste pickers. The residue would be left for the Corporation to pick up.

A similar initiative in Mumbai by Stree Mukti Sangathan explains in detail successful model of integrating waste pickers into effective management of waste (*Refer Annexure 4*).

Observations of the Panel

The problem of the garbage dump in Kodungaiyur is complex and multifaceted. On the face of it, the interests of residents, corporation and the waste pickers may seem to be in conflict. The residents want the dump out. Waste pickers make a living of the garbage, but are accused of burning and causing pollution. Corporation wants to continue dumping in Kodungaiyur, and is also blamed for burning and causing pollution. The Corporation has historically used the waste pickers as their scapegoats, and would like to at least keep the waste pickers away to be seen as doing something to offset the illegality of dumping.

It is clear to us that living near a smoldering garbage dump is like living near hell. We can sympathize with the anguish of the parents who see their children suffering and are helpless to do anything to stop the cause. Going by the results of the two air samples taken from Kodungaiyur, it is clear that children and adults alike breathe a toxic cocktail of chemicals, some of which are confirmed carcinogens. The fact that there are children and women of child-bearing age working inside the highly poisonous dump yard is even more shocking. The samples analyzed reveal more than 33 toxic chemicals.

The dump presents to us the ugly truth of our society's consumptive and wasteful culture, the lack of creativity in developing solutions, and our insensitive, even racist approach to palming off problems on unsuspecting, vulnerable and for the most part poor and marginalized communities.

Dioxins and furans – that are among the most toxic chemicals known to science – are inevitable by-products when mixed garbage is burnt. Because of their characteristics of bioaccumulation and biomagnification, these chemicals are likely to be found in significant concentrations in the fatty tissue of living things. Milk and fat in any form and from all sources – mothers, cows, buffaloes – are likely to be repositories of these deadly chemicals that can affect virtually every system in the human body. The fact that people routinely graze their cows and buffaloes inside the garbage dump is a practice fraught with dangers for the consumers of the milk. If breast milk too were contaminated, it would present a very difficult and dangerous proposition for mothers, especially poor ones.

The Corporation is guilty on several counts. It has located a dump yard at an inappropriate location and has failed in more than two decades to explore alternative means of addressing the garbage problem. It has ignored repeated warnings, pleas and demands by local residents and the Tamilnadu Pollution Control Board to stop burning and dumping. It has violated the MSW Rules on a number of counts, and most egregiously by collecting unsegregated garbage and dumping it. The Rules require local bodies to collect only pre-segregated garbage.

The Corporation's proposal to set up a composting yard to deal with a portion of the wastes that arrives is fraught with problems. Mixed waste composting is a messy, smelly affair that inevitably yields compost that is extremely toxic in nature.

Instead, we find a number of working models from around the country and even from Tamilnadu like Vellore and Perambalur that have two things in common. All working and efficient models are decentralized and all deal with the collection of segregated garbage, and all are publicly or community owned and operated. In some models, like in the Delhi scheme, waste pickers are officially acknowledged by the local civic agency. To the extent that such decentralized schemes of handling segregated garbage can be promoted, the better.

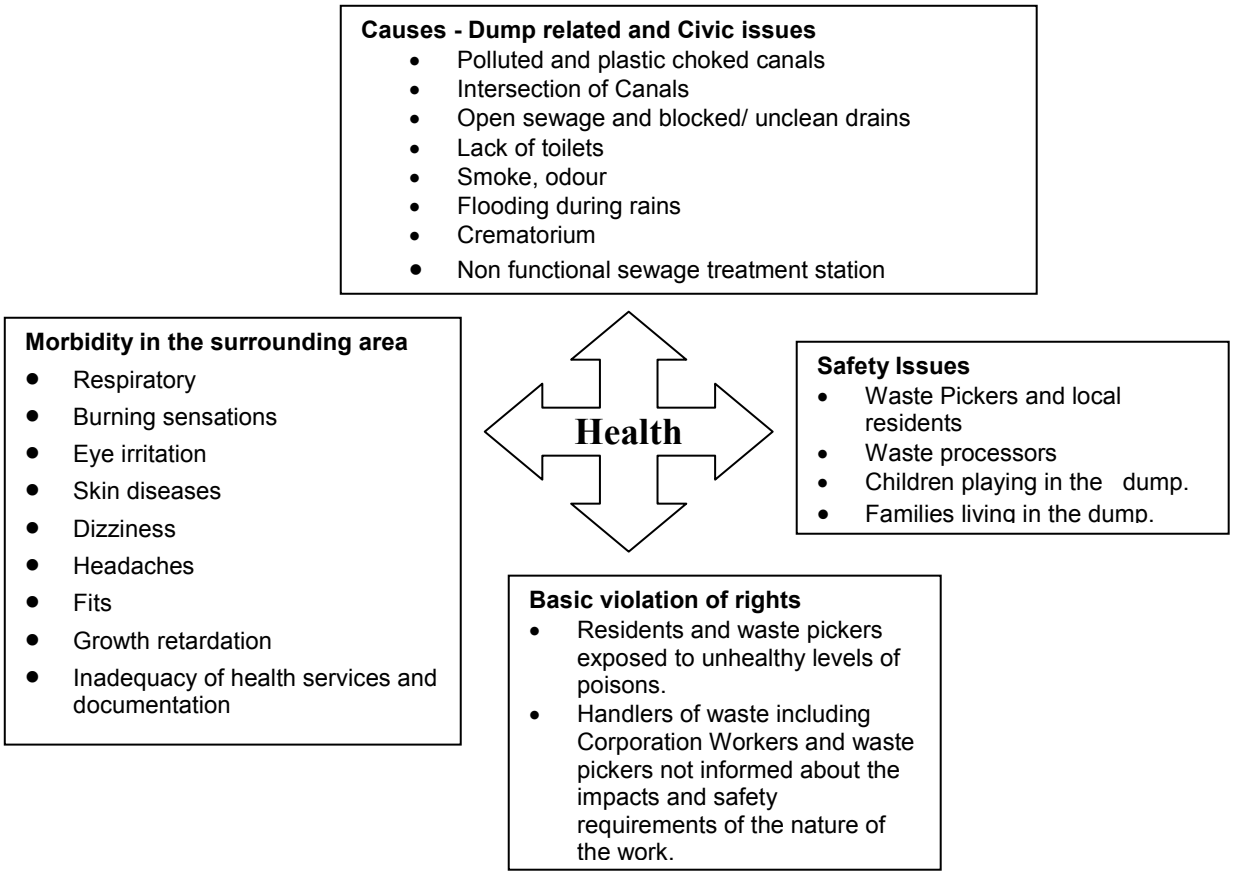
Health

The most common health effects would be allergies leading to respiratory and skin diseases. People with allergic tendencies (people who wheeze or sneeze easily, for instance) can be very sensitive to pollution; they could develop severe allergic reaction resulting in severe bouts of asthma, which could even be fatal. Prevalent atmospheric conditions cause acute inflammation of the mucous membranes. Its recovery in initial stages is full if further exposure is stopped; if the exposure continues it may lead to conjunctivitis, laryngitis and pneumonia.

The most dangerous health effect is of cancer causing agents. The results of exposure to Benzene and others may not be evident immediately but will show up as cancerous growths in the skin, throat, lungs, urinary bladder and virtually any of the internal organs of the body.

The constant exposure to such fumes and smokes interferes with appetite, causes a loss of the sense of smell. Although many of the waste pickers put on a brave face and said that the work does not affect them, we could spot many malnourished women, some with ulcerations and abscesses on the skin. *Refer fig 1.*

Fig 1:



Waste Pickers/ recyclers

Nearly 7000 people, with a substantial number of women, make a living recovering resources – glass, paper, metals, plastic – from the Kodungaiyur dump. It is highly likely that some of them burn the garbage to gain better access to the resources within, thereby causing severe air pollution. Waste pickers come from the lowest economic strata – and often from marginalized communities such as schedule castes – indicating to us that caste, discrimination and notions of impurity continue to be prevalent even today. It is clear that waste pickers who work inside the dumps are at highest risk from the air pollution. It is also clear to us that among the various stakeholders – the consumers and households in Chennai that generate garbage, the Corporation, local residents – the waste pickers are the only ones that are actually engaged in an activity that can be perceived as an environmental good.

Rather than turn to crime or despondency due to poverty or wait for the Government to evolve the means to support them, waste pickers have chosen to strike out independently and engage in a socially useful and economically viable profession. That there is much to be improved in this profession is an understatement. However, it is in drastically improving the conditions of waste picking and decentralizing their work that holds the secret to the solution of Chennai's garbage problem. The profession as it stands now should be phased out and the people involved need to be appropriately rehabilitated.

Socio-economic Context

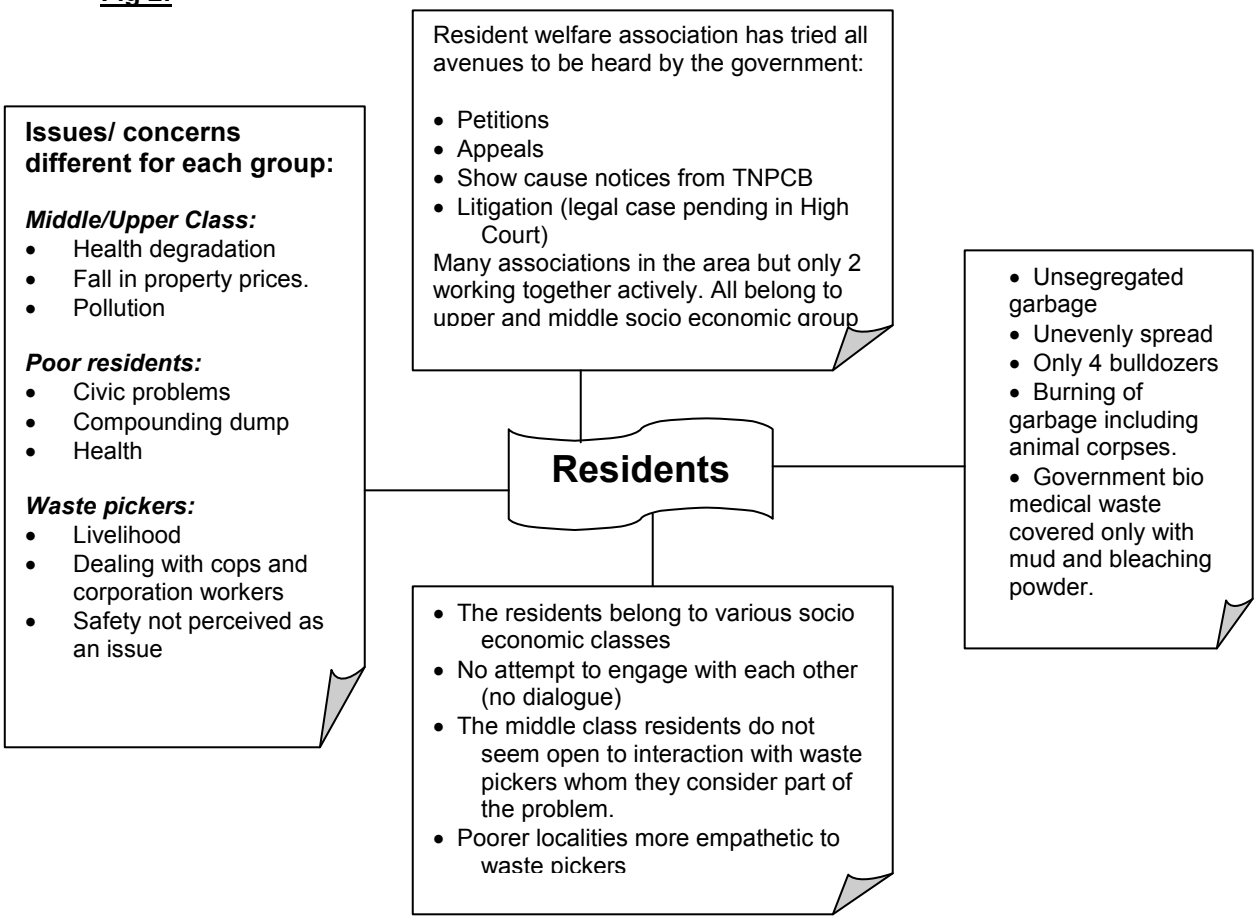
We noticed considerable animosity and suspicion among different interest groups. Middle class residents were dismissive and unhappy about waste pickers. Working class residents, from Raja Rathinam Nagar for instance, were more sensitive to the livelihood needs of the waste pickers. Most waste pickers, while acknowledging the pollution, were also concerned that the knee-jerk reaction to the pollution could jeopardize their source of income. Among the waste pickers, there is hostile rivalry between the traditional pickers who sort through the valuable fresh garbage, and the others that pick through the garbage left over by the former. The traditional pickers blame the other group for setting fire to the garbage.

Many of the middle-class residents were particularly concerned because they had sunk their life's savings into their properties approved by the Government. The garbage dump not only suppressed real estate prices, but also foreclosed any expansion of urban infrastructure and development in the area.

Residents in R.R. Nagar, for instance, were clear that the overall sanitation and hygiene needed to improve. Garbage dump or not, their lives remained miserable because of the abysmal infrastructure for sanitation in the area.

The residents are reasonably well organised, with middle-class residents having taken the lead in organizing protests and articulating demands. While residents in Ezhil Nagar and R.R. Nagar work through community or political associations, the waste pickers are totally unorganized. Organisations of and led by waste pickers would be an important requirement without which the chances of arriving at a socially just solution to the garbage problem would be impossible.

Fig 2:



Recommendations of the Panel

1. Garbage Burning

Burning in the dump must be stopped immediately. The Corporation should be held ultimately liable for any violation of the ban on burning. The Corporation must conduct meetings with waste picker groups to inform them about the decision to ban burning.

New techniques employed by Chintan to recover metal from encased material without burning need to be introduced among the waste pickers.

2. Garbage Dumping

Dumping or handling of garbage from other parts of Chennai at Kodungaiyur must be phased out in a time-bound fashion and no later than within a year. Dumping along the road sides by private parties must be stopped immediately, and prosecution and deterrent penalties should be imposed on violators. Industrial and biomedical wastes should not be allowed to enter the municipal waste stream. Industries and medical institutions should be held ultimately responsible to ensure this.

The existing site should be rehabilitated to ensure that buried wastes do not present an ongoing environmental and health threat in the future.

Kodungaiyur is an unsuitable location for locating a centralized garbage facility, leave alone a dump yard. The initial location was illegal and unmindful of location criteria. That mistake cannot be used as a justification to commit another by regularizing the dumpsite. The proposal to set up a mixed waste composting yard at this location will compound existing problems and ensure that the local community will have no relief from their decades-long misery. This proposal must be dropped.

At the maximum, the wastes of the communities in the immediate vicinity can be handled at this location in strict adherence to the MSW Rules.

3. Implement the Law

The MSW Rules should be diligently implemented. Only segregated garbage should be collected. Each zone's garbage should be handled within the geographical confines of that zone, with decentralized composting yards and resource recovery stations.

4. Registration of waste pickers and scrap merchants

The Government, or better still, a trade union or NGO should conduct a survey of waste pickers and others in the business of resource recovery with a view to registering them, acknowledging their contribution and integrating them in the solutions to Chennai's garbage crisis.

Scrap merchants who have set up shops within the residential area should be vacated immediately and relocated to a suitable place in the near-term.

Ideally for Kodungaiyur, the Corporation of Chennai should do the numeration and registration of all waste pickers with the help of Service organizations or NGOs. The Commissioner of the Corporation should sign their ID tags. If done as recommended all segregation of garbage can be left to the registered waste pickers allotted to the decentralized areas.

All registered waste pickers should be registered with the department of Social and Preventive Medicine and the Children below 12 years should be registered with the Department of Social Paediatrics, both belonging to the Stanley Medical College. They should receive health advice and medical care at Stanley and its associate hospitals free of cost

5. Decentralised garbage management

Phasing out of dumping in Kodungaiyur can succeed only if we simultaneously phase in neighborhood and ward-level garbage management. Rather than hand it to private companies, such decentralized garbage management should employ organized and trained groups of existing waste pickers with attention paid to improving their work conditions. That can be done by ensuring that individual generators of garbage (households or commercial establishments) segregate their garbage, and by providing the waste pickers with hygienic and convenient garbage sorting areas and personal protective equipment. Decentralised garbage management should also plan for setting aside space for scrap merchants to set up and store accumulated scrap.

6. Implement Extended Producer Responsibility

Items like tyres, batteries and fluorescent lamps are arguably the responsibility of the manufacturers. The Tamilnadu Government should promulgate a Government Order requiring manufacturers to take back end-of-life products for treatment, disposal or recycling. Such items should not be allowed to enter the municipal waste stream.

7. Health and Environment

Conduct a widespread health and environmental survey to assess the existing damage and identify rehabilitation measures with the help of the three Government medical colleges. Waste pickers must be given training to enable them to understand the benefits and dangers to the environment. The training should also introduce them to simple techniques that will help them do their jobs without harming themselves or the environment.

An assessment of the possible presence of radio active elements like Radon and other isotopes which might emanate from hospital and lab waste (eg; I 131 used for thyroid studies). BARC Mumbai and / or the Nuclear Physics Dept. of the Madras University can do this.

8. Socio-medical Rehabilitation of Children

Waste picker children – A comprehensive and realistic rehabilitation plan taking into consideration all aspects including the social, health and economic status of the children employed in the dump should be formulated. Children should not be allowed into the dump, and alternative facilities such as Balwadi and access to education for the waste picker children need to be organized as a matter of priority.

Resident children – Other children belonging to poorer backgrounds and are directly impacted should be given special pediatric care and also basic educational facilities.

Several Balwadis are required in the area considering that women that are the main bread earners in many working class families have no place to leave their children in during the day.

9. Civic Amenities

Arrange for underground sewage, well-maintained public toilets and basic amenities, including clean drinking water, particularly for the residents of Rajarathinam Nagar, and Ezhil Nagar. Residents of Panakara Nagar should be provided with alternative housing at a safe location on a priority basis.

ANNEXURE 1

Factsheet on Chemicals Found in Air Sample Taken Downwind of Municipal Waste Burning Site at Kodungaiyur Dump Yard

Sampling Date/Time: 22 January 2007, 3:20 pm
Sampling Location: Kodungaiyur Dumping Ground
Other description: There was a pungent odour of putrified and burnt garbage during the sampling. The wind was slow and shifty. During sampling, it was blowing from West to East
Sample taken in the presence of: The panel members and residents of Kodungaiyur

Findings:

1. Total of 33 chemicals found.
2. 18 out of 33 chemicals exceed the health-based standards set by United States Environmental Protection Agency Region 6 or other regulatory authorities
3. 5 out of 33 chemicals (1,3-Butadiene, Benzene, Chloromethane, 1,4-Dichlorobenzene, Acrylonitrile) are known to cause cancer in humans and/or animals.
    a) 1,3-Butadiene was found 14,348 times higher than the safe levels
    b) Benzene was found 1,680 times higher than the safe levels
    c) Acrylonitrile was found 607 times higher than the safe levels
    d) Chloromethane was found 200 times higher than the safe levels
    e) 1,4-Dichlorobenzene was found 19.64 times higher than the safe levels

4. Out of the 33 chemicals found - 26 chemicals target the eyes, 25 chemicals target the respiratory system and Central Nervous System, 23 chemicals target the skin, 12 chemicals target the liver, 10 chemicals target the kidneys, 7 chemicals target the blood, 5 chemicals target the reproductive system, 4 chemicals target the Cardio Vascular System, 3 chemicals target the Peripheral Nervous System, 2 chemicals target the gastrointestinal tract and 1 chemical targets the bone marrow and heart.

List of Chemicals found:

S No	Name of Chemical	Levels detected (ug/m3)	Safe Level (ug/m3)	Number of times above health-based screening levels	Health Effects	Target Organs	Carcinogen
1.	**Hydrogen Sulphide**	**21**	**1.0** (*US EPA Region 6 health based screening levels*)	**21**	Irritation of eyes, respiratory system; coma, convulsions; conjunctivitis, eye pain, discharge of tears, abnormal visual intolerance to light, dizziness, headache, weakness, exhaustion, irritability, insomnia; gastrointestinal disturbance	Eyes, respiratory system, central nervous system	No
2.	**Carbonyl Sulphide**	**20**	**8.0** (*Texas Short Term screening levels*)	**2.625**	NA	NA	NA
3.	**Methyl Mercaptan**	**23**	**2.10** (*US EPA Region 6 health based screening levels*)	**10.95**	Irritation of eyes, skin, respiratory system; convulsions	Eyes, skin, respiratory system, central nervous system, blood	
4.	**Carbon Disulphide**	**11**	**3** (*Texas Long Term screening levels*)	**3.67**	Dizziness, headache, poor sleep, weakness, exhaustion, anxiety, weight loss, coronary heart disease; gastritis; kidney, liver injury; eye, skin burns; dermatitis; reproductive effects	Central nervous system, peripheral nervous system, cardiovascular system, eyes, kidneys, liver, skin, reproductive system	No
5.	**Methyl Ethyl Ketone**	**95**	**1000** (*USEPA Region 6 health based screening levels*)	--	Irritation of eyes, skin, nose; headache; dizziness; vomiting; dermatitis	Eyes, skin, respiratory system, central nervous system	No
6.	**n-Hexane**	**48**	**210** (*USEPA Region 6 health based screening*	--	Irritation of eyes, nose; nausea, headache; muscle weakness; dermatitis; dizziness; chemical	Eyes, skin, respiratory system, central nervous system, peripheral nervous	No

S No	Name of Chemical	Levels detected (ug/m3)	Safe Level (ug/m3)	Number of times above health-based screening levels	Health Effects	Target Organs	Carcinogen
			levels)		pneumonitis	system	
7.	**Benzene**	**420**	**0.25** (*USEPA Region 6 health based screening levels*)	**1680**	Irritation of eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; weakness, exhaustion; dermatitis; bone marrow depression; [potential occupational carcinogen]	Eyes, skin, respiratory system, blood, central nervous system, bone marrow **Carcinogen:** leukaemia or blood cancer	Yes
8.	**4-Methyl-2-Pentanone**	**5.9**	**83** (*USEPA Region 6 health based screening levels*)	--	Irritation of eyes, skin; headache, drowsiness; dermatitis	Eyes, skin, central nervous system	No
9.	**Toluene**	**190**	**188** (*Texas Long Term screening levels*)	**1.01**	Irritation of eyes, nose; weakness, exhaustion, confusion, euphoria, dizziness, headache; anxiety, muscle fatigue, insomnia; dermatitis; liver, kidney damage	Eyes, skin, respiratory system, central nervous system, liver, kidneys	No
10.	**2 – Hexanone**	**14**	**4** (*Texas Long Term screening levels*)	**3.5**	Irritation of eyes, nose; peripheral neuropathy: lassitude (weakness, exhaustion), paresthesia; dermatitis; headache, drowsiness	Eyes, skin, respiratory system, central nervous system, peripheral nervous system	No
11.	**Chlorobenzene**	**5.9**	**63** (*USEPA Region 6 health based screening levels*)	--	Irritation of eyes, skin, nose; drowsiness, incoordination; central nervous system depression; in animals: liver, lung, kidney injury	Eyes, skin, respiratory system, central nervous system, liver	No

S No	Name of Chemical	Levels detected (ug/m3)	Safe Level (ug/m3)	Number of times above health-based screening levels	Health Effects	Target Organs	Carcinogen
12.	**Ethylbenzene**	**100**	**1100** (*USEPA Region 6 health based screening levels*)	--	Irritation of eyes, skin, mucous membrane; headache; dermatitis; could lead to coma	Eyes, skin, respiratory system, central nervous system	No
13.	**m,p-Xylenes**	**45**	--	--	Irritation of eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; nausea, vomiting, abdominal pain; dermatitis	Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys	No
14.	**Styrene**	**200**	**11** (*Texas Long Term screening levels*)	**18.18**	Irritation of eyes, nose, respiratory system; headache, weakness, exhaustion, dizziness, confusion, drowsiness, possible liver injury; reproductive effects	Eyes, skin, respiratory system, central nervous system, liver, reproductive system	No
15.	**o-Xylene**	**19**	**730** (*USEPA Region 6 health based screening levels*)	--	Irritation of eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, anorexia, nausea, vomiting, abdominal pain; dermatitis	Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys	No
16.	**n-Nonane**	**37**	--	--	NA	NA	NA
17.	**Cumene**	**10**	**400** (*USEPA Region 6 health based screening levels*)	--	Irritation of eyes, skin, mucous membrane; dermatitis; headache, coma	Eyes, skin, respiratory system, central nervous system	No
18.	**Alpha Pinene**	**9.60**	--	--	**--**	--	--
19.	**4-Ehtyltoluene**	**5.80**	--	**--**	--	--	--

S No	Name of Chemical	Levels detected (ug/m3)	Safe Level (ug/m3)	Number of times above health-based screening levels	Health Effects	Target Organs	Carcinogen
20.	**1,3,5-Trimethylbenzene**	**7.90**	**6.2** (*USEPA Region 6 health based screening levels*)	**1.27**	Irritation of eyes, skin, nose, throat, respiratory system; bronchitis; headache, drowsiness, weakness, exhaustion, dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis	Eyes, skin, respiratory system, central nervous system, blood	No
21.	**1,2,4-Trimethylbenzene**	**9.0**	**6.2** (*USEPA Region 6 health based screening levels*)	**1.45**	Irritation of eyes, skin, nose, throat, respiratory system; bronchitis; headache, drowsiness, fatigue, dizziness, nausea, incoordination; vomiting, causes confusion; chemical pneumonitis	Eyes, skin, respiratory system, central nervous system, blood	No
22.	**1,4-Dichlorobenzene**	**5.50**	**0.280** (*USEPA Region 6 health based screening levels*)	**19.64**	Irritation of eyes, swelling periorbital (situated around the eye); profuse rhinitis; headache, anorexia, nausea, vomiting; weight loss, jaundice, cirrhosis; in animals: liver/kidney injury; [potential occupational carcinogen]	Liver, respiratory system, eyes, kidneys, skin **Cancer Site** [in animals: liver & kidney cancer]	Yes
23.	**d-Limonene**	**120**	--	--	Irritation of eyes, skin, nose, throat; headache, dizziness, convulsions; blood in the urine, kidney damage; abdominal pain, nausea, vomiting, diarrhoea; chemical pneumonitis	Eyes, skin, respiratory system, central nervous system, kidneys	No
24.	**Chloromethane**	**220**	**1.1** (*USEPA Region 6 health based screening levels*)	**200**	Dizziness, nausea, vomiting; visual disturbance, stagger, slurred speech, convulsions, coma; liver, kidney damage; reproductive damage;	Central nervous system, liver, kidneys, reproductive system **Cancer Site** [in animals: lung, kidney & forestomach	Yes

S No	Name of Chemical	Levels detected (ug/m3)	Safe Level (ug/m3)	Number of times above health-based screening levels	Health Effects	Target Organs	Carcinogen
					[potential occupational carcinogen]	tumors]	
25.	**1,3-Butadiene**	**99**	**0.0069** (*USEPA Region 6 health based screening levels*)	**14348**	Irritation of eyes, nose, throat; drowsiness, dizziness; reproductive damages; [potential occupational carcinogen]	Eyes, respiratory system, central nervous system, reproductive system **Cancer Site** [blood cancer]	Yes
26.	**Chloroethane**	**13**	**2.3** (*USEPA Region 6 health based screening levels*)	**2.16**	Incoordination, abdominal cramps; cardiac arrest; liver, kidney damage	Liver, kidneys, respiratory system, cardiovascular system, central nervous system	No
27.	**Ethanol**	**130**	**--**	--	Irritation of eyes, skin, nose; headache, drowsiness, weakness, exhaustion, cough; liver damage; reproductive damages	Eyes, skin, respiratory system, central nervous system, liver, blood, reproductive system	No
28.	**Acetonitrile**	**60**	**34** (*Texas Long Term screening levels*)	**1.76**	Irritation of nose, throat; nausea, vomiting; chest pain; weakness, exhaustion, convulsions; in animals: liver, kidney damage	Respiratory system, cardiovascular system, central nervous system, liver, kidneys	No
29.	**Acrolein**	**78.0**	**0.021** (*USEPA Region 6 health based screening levels*)	**3714**	Irritation of eyes, skin, mucous membrane; chronic respiratory disease	Eyes, skin, respiratory system, heart	No
30.	**Acetone**	**300**	**370** (*USEPA Region 6 health based screening levels*)	**--**	Irritation of eyes, nose, throat; headache, dizziness, central nervous system depression; dermatitis	Eyes, skin, respiratory system, central nervous system	No
31.	**Isopropyl Alcohol**	**6.30**	--	--	Irritation of eyes, nose, throat; drowsiness, dizziness, headache; dry	Eyes, skin, respiratory	No

S No	Name of Chemical	Levels detected (ug/m3)	Safe Level (ug/m3)	Number of times above health-based screening levels	Health Effects	Target Organs	Carcinogen
					cracking skin; in animals: narcosis	system	
32.	**Acrylonitrile**	**17**	**0.0280** (*USEPA Region 6 health based screening levels*)	**607**	Irritation of eyes, skin; asphyxia; headache; sneezing; nausea, vomiting; lassitude (weakness, exhaustion), dizziness; skin vesiculation; scaling dermatitis; [potential occupational carcinogen]	Eyes, skin, cardiovascular system, liver, kidneys, central nervous system **Cancer Site** [brain tumors, lung & bowel cancer]	Yes
33.	**Vinyl Acetate**	**62**	**15** (*Texas Long Term screening levels*)	**4.133**	Irritation of eyes, skin, nose, throat; hoarseness, cough; loss of smell; eye burns, skin blisters	Eyes, skin, respiratory system	No

ANNEXURE 2

Zero Waste[5]

Zero waste goes beyond technical interventions. It has at its core a set of social and ethical criteria that are required to be considered even at the stage of designing a product.

Some basic questions to evaluate the impacts on economy, environmental and health arising from the production and use of material:

1. Necessity: Is the product necessary?
2. Environmental Impact: Can the product be made from material that minimize negative environmental impacts?
3. Economic Impact: Can the need for the product be fulfilled using locally available resources and can the product be manufactured locally?
4. Conservation: Can the product be designed to reduce the resources required?
5. Transportation: Can it be manufactured close to the point of use so as to minimize transportation and packaging?
6. Post-use recovery: Can the product be reused, recycled or safely composted at the end of its life?

The following aspects need to be considered while addressing the problem of garbage in an area:

- Involve local people and generators of garbage;
- Boost the local economy by generating entrepreneurial livelihood activities that are healthy, remunerative, meaningful and self-sustaining;
- Not be wasteful or propagate the use of wasteful material;
- Not transfer the problem to a different community;
- Not consider recycling as an option if that operation has the potential to pollute or affect worker health;

Supports Sustainability

A Zero Waste strategy supports all three of the generally accepted goals of sustainability - economic well being, environmental protection, and social well being:

Economic well-being is improved by enabling organizations to identify inefficiencies in processes, products and services and thereby to find cost-saving solutions to them.

- Waste Reduction Improved efficiency and lower costs
- Costs of compliance with regulations is reduced

Environmental protection is enhanced by reducing (ideally to zero) hazardous and solid wastes to nature and by reducing the need for energy generation and hydrocarbon extraction.

- Reduces demand for resources and energy from nature
- Reduces wastes to nature

[5] International POPs Elimination Project. Case Study of Zero Waste Kovalam by Nityanand Jayaraman www.ipen.org

Social well being is enhanced through efficiency improvements that allow more resources to be available for all. In addition, more complete use of "wastes" will create jobs in return logistics and reprocessing activities.

- Waste managers become resource managers
- Opportunities in return logistics
- New products from recovered materials

Today's system uses large amounts of new raw materials as shown in *Figure 1*. In addition, large amounts of materials are sent to landfills or incinerated. A Zero Waste society would use far fewer new raw materials and send no waste materials to landfills. As shown in *Figure 2*, all materials would either return as reusable or recycled materials or would be suitable for use as compost.

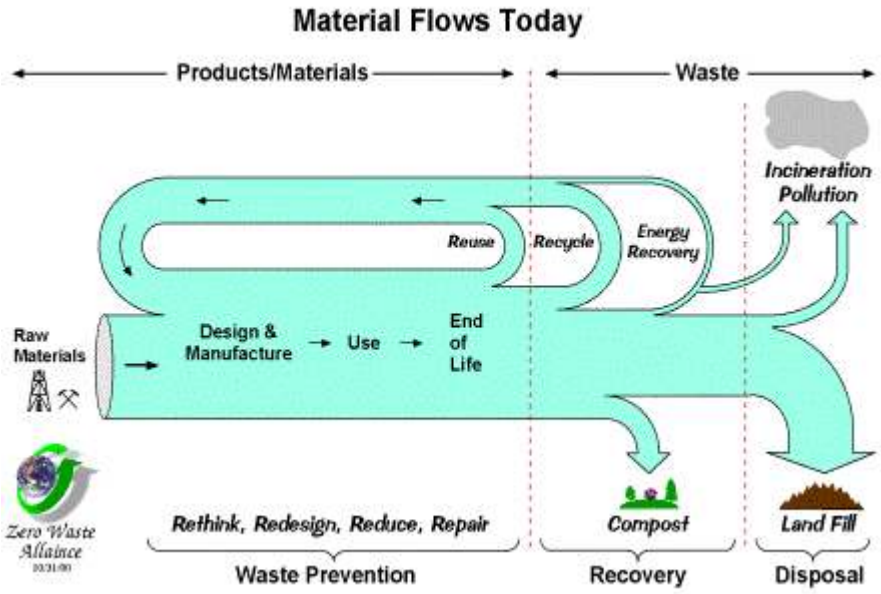


Figure 1

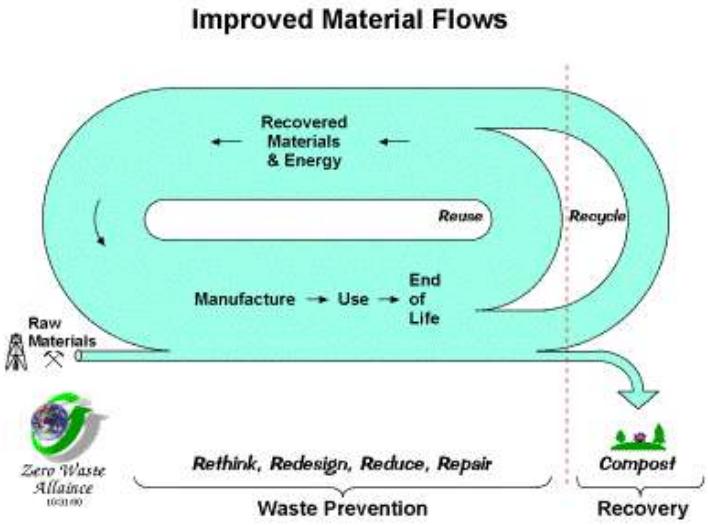


Figure 2.

Conclusion

Currently we have a growing population faced with limits of resources from the environment. We understand that our society and industrial systems must begin to mimic nature and move from being primarily linear to being cyclical. Each material must be used as efficiently as possible and must be chosen so that it may either return safely to a cycle within the environment or remain viable in the industrial cycle.

The vision of Zero Waste can be seen as a solution to these needs and a key to our grandchildren's future. Zero solid waste, zero hazardous waste, zero toxic emissions, zero material waste, zero energy waste and zero waste of human resources will protect the environment and lead to a much more productive, efficient, and sustainable future. The use of an endpoint goal of "zero" recognizes that simple small steps without a goal may not achieve a sustainable future while use of a clear defined goal will lead to more rapid innovative improvements.

Zero Waste promotes not only reuse and recycling, but also, and more importantly, promotes prevention - designs that consider the entire product life cycle. These new designs will strive for reduced materials use, use of recycled materials, use of more benign materials, longer product lives, reparability, and ease of disassembly at end of life.

A Zero Waste strategy is a sound business tool that, when integrated into business processes, provides an easy to understand stretch goal that can lead to innovative ways to identify, prevent and reduce wastes of all kinds. It strongly supports sustainability by protecting the environment, reducing costs and producing additional jobs in the management and handling of wastes back into the industrial cycle. A Zero Waste strategy may be applied to businesses, communities, industrial sectors, schools and homes.

Source: The Case for Zero Waste – www.zerowaste.org

ANNEXURE 3

Schedule -II

[see rules 6(1) and (3), 7(1)]

Management of Municipal Solid Wastes - Source: Ministry of Environment and Forests. For the complete gazette visit http://envfor.nic.in/

S.no	Parameters	Compliance criteria
1.	**Collection of municipal solid wastes**	1. Littering of municipal solid waste shall be prohibited in cities, towns and in urban areas notified by the State Governments. To prohibit littering and facilitate compliance, the following steps shall be taken by the municipal authority, namely :- i. Organising house-to-house collection of municipal solid wastes through any of the methods, like community bin collection (central bin), house-to-house collection, collection on regular pre-informed timings and scheduling by using bell ringing of musical vehicle (without exceeding permissible noise levels); ii. Devising collection of waste from slums and squatter areas or localities including hotels, restaurants, office complexes and commercial areas; iii. Wastes from slaughter houses, meat and fish markets, fruits and vegetable markets, which are biodegradable in nature, shall be managed to make use of such wastes; iv. Bio-medical wastes and industrial wastes shall not be mixed with municipal solid wastes and such wastes shall follow the rules separately specified for the purpose; v. Collected waste from residential and other areas shall be transferred to community bin by hand-driven containerized carts or other small vehicles; vi. Horticultural and construction or demolition wastes or debris shall be separately collected and disposed off following proper norms. Similarly, wastes generated at dairies shall be regulated in accordance with the State laws; vii. Waste (garbage, dry leaves) shall not be burnt; viii. Stray animals shall not be allowed to move around waste storage facilities or at any other place in the city or town and shall be managed in accordance with the State

laws.

2. The municipal authority shall notify waste collection schedule and the likely method to be adopted for public benefit in a city or town.

3. It shall be the responsibility of generator of wastes to avoid littering and ensure delivery of wastes in accordance with the collection and segregation system to be notified by the municipal authority as per para 1(2) of this Schedule.

2. Segregation of municipal solid wastes

In order to encourage the citizens, municipal authority shall organise awareness programmes for segregation of wastes and shall promote recycling or reuse of segregated materials.

The municipal authority shall undertake phased programme to ensure community participation in waste segregation. For this purpose, regular meetings at quarterly intervals shall be arranged by the municipal authorities with representatives of local resident welfare associations and non-governmental organizations.

3. Storage of municipal solid wastes

Municipal authorities shall establish and maintain storage facilities in such a manner as they do not create unhygienic and insanitary conditions around it. Following criteria shall be taken into account while establishing and maintaining storage facilities, namely :-

i. Storage facilities shall be created and established by taking into account quantities of waste generation in a given area and the population densities. A storage facility shall be so placed that it is accessible to users;

ii. Storage facilities to be set up by municipal authorities or any other agency shall be so designed that wastes stored are not exposed to open atmosphere and shall be aesthetically acceptable and user-friendly;

iii. Storage facilities or 'bins' shall have 'easy to operate' design for handling, transfer and transportation of waste. Bins for storage of bio-degradable wastes shall be painted green, those for storage of recyclable wastes shall be printed white and those for storage of other wastes shall be printed black;

iv. Manual handling of waste shall be prohibited. If unavoidable due to constraints, manual handling shall be carried out under proper precaution with due care for

safety of workers.

4.	**Transportation of municipal solid wastes**	Vehicles used for transportation of wastes shall be covered. Waste should not be visible to public, nor exposed to open environment preventing their scattering. The following criteria shall be met, namely:- i. The storage facilities set up by municipal authorities shall be daily attended for clearing of wastes. The bins or containers wherever placed shall be cleaned before they start overflowing; ii. Transportation vehicles shall be so designed that multiple handling of wastes, prior to final disposal, is avoided.
5.	**Processing of municipal solid wastes**	Municipal authorities shall adopt suitable technology or combination of such technologies to make use of wastes so as to minimize burden on landfill. Following criteria shall be adopted, namely:- (i) The biodegradable wastes shall be processed by composting, vermicomposting, anaerobic digestion or any other appropriate biological processing for stabilization of wastes. It shall be ensured that compost or any other end product shall comply with standards as specified in Schedule-IV; ii. Mixed waste containing recoverable resources shall follow the route of recycling. Incineration with or without energy recovery including pelletisation can also be used for processing wastes in specific cases. Municipal authority or the operator of a facility wishing to use other state-of-the-art technologies shall approach the Central Pollution Control Board to get the standards laid down before applying for grant of authorisation.
6.	**Disposal of municipal solid wastes**	Land filling shall be restricted to non-biodegradable, inert waste and other waste that are not suitable either for recycling or for biological processing. Land filling shall also be carried out for residues of waste processing facilities as well as pre-processing rejects from waste processing facilities. Land filling of mixed waste shall be avoided unless the same is found unsuitable for waste processing. Under unavoidable circumstances or till installation of alternate facilities, land-filling shall be done following proper norms. Landfill sites shall meet the specifications as given in Schedule -III.

ANNEXURE 4

Stree Mukti Sangathana (SMS), Mumbai

This model of waste management explains the process in various stages on a path to Zero Waste.

Identification and action at dumping sites:

1. Independent quick study of working conditions of waste pickers at dumping grounds with reference to following points
2. Number of waste pickers working at dumping sites
3. The name of organizations they belong to (if any)
4. Security measures especially for women and children at dumping sites
5. Health conditions of waste pickers
6. Safety gears and their use
7. Harassment of waste pickers
8. Quantification of effect of their work and its value
9. How much improvement is possible by better organization, better supervision and better work environment.
10. Current and proposed facilities for their toilet, drinking water and storage of their material.

The following remedies can be employed to improve the situation of waste pickers at dumping ground

- There should be strict ban on children entering dumping ground. All NGOs working with waste pickers should be instructed not to issue I-Cards to the youth below 18 years of age.
- There should be protection for women waste pickers on dumping ground. Most of the women suffer from the gangs working at dumping ground. Security force should take care of such unruly elements.

Kiosks for dry waste

- The local government should provide wooden kiosk for dry waste of following size with locking facility at as many collection points as possible 6½ length x 4½ width x 10½ height.
- These kiosks should be maintained by waste picker groups registered with the local government or with NGO's who can facilitate the working of such kiosks.
- The priority for kiosks should be the area where composting, vermi- composting or Bio -methanation projects are in working conditions or in the planning stage so that segregation at source is promoted and supply of biodegraded material to such projects can be ensured.
- While giving contracts for such kiosks other members from such groups can be trained in house to house collection and composting so that they can further reduce the waste to be transported to the dumping ground.

Sheds for dry waste

The local government should provide the space for dry waste sheds in each ward to the registered groups or to the cooperatives or organizations of waste pickers with NGOs as facilitators.

Survey of waste pickers

The experience in many cities shows that waste pickers are often not included in the Below Poverty Line quota as they stay in the difficult areas. As per SMS's rough estimate there are 25000 waste pickers in Mumbai. Local governments should carry out the extensive surveys of waste pickers and make their list for future references.

Extended Producer Responsibility

Local governments should immediately identify the products for which buy back policy can be possible. SMS with the help of another local group is in an agreement with the Tetra Pak Company for the collection of Tetra Pak from Mumbai. Most of the Tetra Pak (appox. 100 tons per month) is sent to dumping grounds. The major consumers of Tetra Pak are the Railways and Airport Authority.

House to house Collection

Local government should put in place collection policies for Biodegradable waste from the citizens, for a start in selected area such as public sector colonies. The program should be planned to include waste pickers in the door to door collection of such garbage.

SMS feels that if particular area is given to the waste pickers for door to door collection and processing of dry and wet waste, they can definitely achieve Zero Waste. With cooperation from government departments such as Solid Waste Management Dept., micro planning and implementation of the project would also be possible. Ideal population for an area to be adopted should be 2000 families.

Action Plan for the Area Adoption Scheme

Phase 1:

Awareness programs

Awareness programs for school children and citizens should be initiated along with the implementation of the project. Many effective awareness resources and tools are available on environmental issues connected with the solid waste management. The local government along with NGO's in the field of waste management can initiate school level environmental workshops for the children. Locality wise awareness activities could include lectures, street plays, poster exhibitions, leaflets etc. on segregation of waste.

Simultaneously,

1. Training of the waste pickers in finer sorting of the waste,
2. Training of the waste pickers for manure-making process,
3. Construction of pits
4. Construction of tin shed.

Phase 2:

Activities at the site

- House to house collection of segregated waste.
- Further segregation of the dry waste into paper, plastics, glass, rags & all others on the basis of substances.
- Treatment of the organic waste under technical expertise. Biodegradable Component, which forms bulk of the waste, will be turned into soil conditioner through the kind of process adopted.
- Final treatment of waste.
- Straining / sieving.
- Packaging.
- Storing.
- Marketing.

Role of a local NGO/Union/Cooperative

A Non Governmental Organisation can be identified for the following:

- Initial preparation for the project
- Actual implementation of the project
- Facilitation of the contract procedure with housing complexes
- Training of the women (on job training)
- Organising technical know how
- Liaison with the Municipal authorities
- Monitoring and Supervision
- Marketing of the product such as manure and dry waste
- Support expected from Municipal Corporation.

Micro planning of an area

- Workshop for the waste pickers and workers if the area is under the local government jurisdiction.
- Reporting and Accountability system
- Tempo for the collection of dry waste
- Issuing notices to all the buildings, shop and establishments, hospitals in the selected area with proper time frame for implementation of the new rules. This will require regular follow up.
- Involvement of the staff of Solid waste Department (down the line) responsible for the said area.
- Publicity van for propaganda of segregation of waste and importance of waste management.

- Presence of Municipal officers of Solid Waste Management Dept. in awareness meetings.
- Provision of space for shed for storage of dry waste in the ward.
- Overall support to the model project at all levels.

ANNEXURE 5

The conventional methods of handling garbage are termed waste management. This approach sees all garbage generated as useless and then goes on to manage it by devising technologies to collect it, transport it, bury it, dump it or burn it. Landfills, Incineration or burning of wastes, centralized composting and recycling are some of the unsustainable ways of solid waste management.

Landfills

Landfills are those assigned places or holes in the ground where waste is dumped. Low lying areas are usually selected for this purpose. In developed countries, landfills are holes in the ground lined with plastic sheets and concrete to prevent pollution of the environment due to the poisons that these wastes would release during decomposition. The poisons from a landfill leak out from the sides in the form of a black, smelly toxic liquid called “leachate” These leachates eventually escapes into the ground surrounding the landfills and contaminate the nearby and underground water sources.

Land filling of waste is increasingly being phased out in many of the European countries and US due to their extremely hazardous nature. The basic anatomy of a landfill is layers of different substances such as earth, clay, gravel, plastic and synthetic fabrics. Though a lifecycle of a landfill is usually 25 – 30 years it needs to be monitored for leaks and cracks throughout its lifetime. Due to the nature and quantities of materials and chemicals that are consumed and disposed every year, containing the hazards that they pose to the environment is impossible. Numerous instances in countries like US and Europe prove that ‘Landfills Eventually Do Leak’ and hence become a toxic liability that several generations could inherit.

Even so-called ‘state-of-the-art’ landfills merely delay, rather than eliminate, massive pollution to groundwater and are a leading contributor to global warming. Waste can and should be designed out of our industrial system. Waste is not inevitable. Nor are landfills.

Incineration, waste to energy and open burning

Conventional waste disposal relies significantly on burning garbage, either in the open (common in India) or in machines. The machines are known as incinerators. Incinerators are wasteful because they burn resources that rightfully ought to be conserved for further use. All burn technologies like incinerators use mixed municipal wastes and are dangerous because of the uncontrolled presence of chlorinated hydrocarbons like PVC in our wastes. Such wastes yield dioxins and heavy metals like mercury and Dioxins. Dioxins are the most lethal carcinogens known to humans that produce adverse effects even at extremely low doses. Other burn technologies include gasification, pyrolysis, plasma technology and refuse-derived fuel.

Advanced pollution control equipment cost a lot of money and merely trap the pollutants concentrating them in fly ash and bottom ash. Highly contaminated ash then has to be disposed of in specialized landfills, which will also eventually leak.

Centralised Composting
In this method, mixed waste is allowed to sit for days or weeks before entering the compost process. During this time, poisons from the toxic components of the waste stream contaminate the biodegradable substances that will be composted to form soil conditioners. Hence plastics and other gross impurities, which are usually removed in other types of composting, are by this time too dirty to be viable raw materials for any recycler and end up in a landfill.

Recycling
Recycling has some pitfalls. The most important of them is that not all materials can be recycled. Especially toxic substances should not be recycled because when you recycle a hazardous substance, you also recycle the hazard. Take for instance recycling of PVC. So many poisonous substances go into the production of PVC that inevitably get released during recycling.

Some materials that are recycled ought not to have been produced in the first place. Technologies to recycle without much harm to the environment or human health may exist. However, what is technically possible may not always be efficient or economical.

Perhaps the greatest drawback of recycling is that it does not in anyway discourage the use of inherently, unsustainable materials especially when safer and sustainable alternatives exist.

ANNEXURE 6

Municipal Solid Waste

Municipal solid waste (MSW)[6] is a waste type that includes predominantly household waste (domestic waste) with sometimes the addition of commercial wastes collected by a municipality within a given area. They are in either solid or semisolid form and generally exclude industrial hazardous wastes. The term *residual waste* relates to waste left from household sources containing materials that have not been separated out or sent for reprocessing.

There are five broad categories of MSW:

Biodegradable waste: food & kitchen waste, green waste, paper (can also be recycled).
Recyclable material: paper, glass, bottles, cans, metals, certain plastics, etc.
Inert waste: construction and demolition waste, dirt, rocks, debris.
Composite wastes: Waste clothing, Tetra Paks, Waste plastics such as toys.
Domestic hazardous waste & toxic waste: medication, paints, chemicals, light bulbs, fluorescent tubes, spray cans, fertilizer and pesticide containers, batteries, shoe polish.

Management of Municipal Waste

Municipal waste management is successful only if it results in no harm to the environment. Advocates of such a concept call it 'Zero Waste'.

Zero Waste[7] is a philosophy and a goal that will guide people to re-design our resource-use system to emulate natural cyclical processes where no waste exists. Every stage of any resource-use process must be so designed as to ensure that nothing is generated as an output, deliberately or otherwise, that does not become a useful input into another process. Any output that is destined for land, sea or air should not be a threat to planetary, animal or plant health. The three fundamentals of Zero Waste are:

Reduce
Waste prevention, or "source reduction," means consuming and throwing away less. It includes purchasing durable, long-lasting goods; seeking products and packaging that are as free of toxics as possible; redesigning products to use less raw materials in production, have a longer life, or be used again after its original use.
Source reduction actually prevents the generation of waste in the first place, so it is the most preferred method of waste management and goes a long way toward protecting the environment.

Reuse
Reusing items -- by repairing them, donating them to charity and community groups, or selling them -- also reduces waste. Reusing products, when possible, is even better than recycling because the item does not need to be reprocessed before it can be used again.

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[6] Wikipedia definition of Municipal Waste.
[7] Wikipedia definition of Zero Waste

Recycle

Recycling turns materials that would otherwise become waste into valuable resources. In addition, it generates a host of environmental, financial, and social benefits. Materials like glass, metal, plastics, and paper are collected, separated and sent to facilities that can process them into new materials or products.

- **Composting**

Another form of recycling is composting. Composting is the controlled biological decomposition of organic matter, such as food and yard wastes, into humus, a soil-like material. Composting is nature's way of recycling organic waste into new soil, which can be used in farming, vegetable and flower gardening, landscaping etc,.

Aerobic composting is a method of composting organic wastes using bacteria that need oxygen. This requires that the waste be exposed to air, either via turning or by forcing air through pipes that pass through the material.

Anaerobic composting a method of composting that does not require oxygen. This composting method produces methane. Also known as anaerobic digestion.

Vermi-composting is the end-product of the breakdown of organic matter by some species of earthworms. Vermi-compost is a nutrient-rich, natural fertilizer and soil conditioner.

Extended Producer Responsibility (EPR)

Another concept that countries around the world are employing is EPR. Based on the "polluter pays" principle, EPR entails making manufacturers responsible for the entire lifecycle of the products and packaging they produce. One aim of EPR policies is to internalize the environmental costs of products into their price. Another is to shift the economic burden of managing products that have reached the end of their useful life from local government and taxpayers to product producers and consumers[8].

Implementation of sustainable processes like Zero Waste involves tremendous organizing, enforcements, life style alterations and social unlearning. Unsustainable alternative technologies to Zero Waste, such as Landfills, Incinerators and Waste to Energy are increasingly being adopted as solutions world over. Despite intense research and huge investments, such technologies are considered rather end of pipeline and obsolete solutions in terms of their environmental and human costs.

Decentralisation

The enormity of the problem may baffle many trying to solve the problem but many governments are also actively trying to decentralizing powers to local governments, and develop policies and legislation to establish tailor made systems within which municipalities can operate using local resources and technologies. This often influences

[8] Wealth to waste fact sheet on EPR http://www.ilsr.org/recycling/epr/index.html

the range of options that municipalities can pursue in a range of areas including collection of charges, municipal finance and public participation.

Zero Waste the World Over

Around the world progressive communities and governments as well as innovative business enterprises have already put on the mantle of zero waste.

The entire concept was still in its bare infancy when Canberra, capital of Australia, in 1996 adopted the Zero Waste strategy and the goal was that by 2010 no waste would go into a landfill. Today they are well within this path towards zero waste.

The government owns the entire infrastructure in Canberra and all they do is franchise these facilities to the various industrial interests to use these resources. All that these enterprises need do is to reuse projects or to take them out as material resources for recycling or for composting.

It was from Canberra that the idea spread to New Zealand. Here 38% of the municipalities will have achieved the goal of Zero Waste by 2015. Initially the New Zealand Zero Waste Trust provides a grant. But the essential blue print of the same has to be developed within the local community-their officials, engineers, and managers. An estimated 40,000 jobs will be created over this entire ten-year period with the conversion of local transfer units into resource recovery centers and by the predicted spurt of reuse and recycling businesses all over.

Across the seas, the idea has found eager emulators in California. Del Norte and Santa Cruz, two counties in California have adopted Zero Waste strategies. Even more laudable are the efforts of companies here like Hewlett Packard and Mad River Brewing who have actually seen the bottom line. While the former has achieved an impressive 90% reduction in their waste stream, the latter has managed to cut down 93%. Canada is also definitely on the path to Zero waste. Here the Nova Scotia province is cutting down on landfills by almost 50%.

The idea is over sixteen years old. And all over it seems to be generating much excitement and enthusiasm. By far, this has established that waste management at the backend alone is a limited proposition. And all over the natural environment is becoming a primary driver of a healthy political action and behavioral change. Evidence from all over also suggests that the huge challenges that are present can be met and that the long-term benefits are enormous.

Encompassed by the vision of a Zero Waste society and the three core principles is a basket of technologies and strategies to help move from the old industrial system to the new Zero Waste system. Many involve changing the rules to make wasting more costly and difficult - and waste minimization, reuse, repair, recycling and composting more attractive[9].

[9] New Zealand Zero Waste Trust - www.zerowaste.co.nz

Landfill Fees
Use real cost accounting to increase landfill fees to realistic levels. Introduce a standard minimum national landfill fee.

Landfill Bans
Progressively ban toxic materials, and materials for which markets exist or could realistically exist in the future.

User fees (Pay as You Throw)
Ensure that wherever waste is produced, the waste generator pays the cost of disposal.

Extended Producer Responsibility
Create incentives and disincentives that encourage producers to take responsibility for the life-cycle of their products and the components they are made from.

Packaging Levy
Establish a minimum packaging levy on all non-biodegradable and non-reusable packaging.

Deposit Refund Schemes
Also referred to as "bottle bills". A simple mechanism for funding the recycling of food and beverage containers. It also creates meaningful income and employment opportunities.

Resource Recovery Infrastructure
Ensure that every wasting opportunity at home, in the street or in the factory is matched by, or replaced with a resource recovery opportunity. Make resource recovery visible, accessible, and more convenient than other waste disposal options.

Resource Recovery Parks
Establish Resource Recovery Parks at every transfer station or major disposal point. Some will be small staging posts for larger 'Serial Recovery Systems' where repair, reuse and recycling businesses collaborate to extend the life of products and reintegrate them into society or safely into the environment.

Materials Exchanges
Create a network of materials exchanges to enable industry to feed off each other's waste products. There could be one electronic system for the country.

Branding Systems for Zero Waste Businesses
Develop criteria for Zero Waste businesses which, if meeting the set criteria, would be able to display a nationally recognised brand.

Mandatory Corporate Environmental Reporting
Ensure that all businesses produce waste plans and report on their progress towards targets.