Choking in Garbage

Analysis of Ambient Air near an Open Municipal Waste Burning Site in Pallikaranai Marsh, Chennai

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The problem on garbage in the city:

Chennai generates about 3500 tonnes of garbage every day. This garbage, also known as "municipal waste" comprises of the organic waste, plastic, packaging waste, paper, metal, glass, construction debris and other components like ash, sand and grit. Though the Municipal Corporation of Chennai is responsible of garbage collection and disposal on a daily basis; in March 2000 the Corporation privatised garbage collection in certain parts of the city in order to make it more "efficient and systematic". It signed a seven year contract with Chennai Environment Sciences (CES) Onyx to collect municipal solid waste including household and commercial garbage and demolition debris for three of Chennai's 10 zones. CES Onyx is a subsidiary of Onyx Asia Holdings Pvt. Ltd, which, in turn, is a subsidiary of the $39 billion French Multinational Vivendi – a global giant in municipal & industrial waste management, transportation, water systems, communications and energy[i]. The zones that were given to Onyx to collect the garbage from were - Zone 6, most of Triplicane; Zone 8, most of Kodambakkam; and zone 10 includes T. Nagar, Tiruvanimayur, Adyar (some of the area also extends into Velachery). In total, these three zones cover about one-fourth of the city's 8 million population and generate about 1000 tonnes of garbage daily.

Everyday the Chennai Municipal Corporation and CES Onyx dump the garbage collected from around the city, and the Metrowater dumps raw sewage, in Perungudi, in the ecologically sensitive Pallikaranai Marshlands.

Pallikaranai is the largest natural rain water harvesting system in the region which is linked to the Bay of Bengal through a network of backwaters and outlets. Pallikaranai In its original state, the marshland used to store large quantities of storm water, even while allowing excesses to flow into the sea. This served two important functions – flood control in the hinterland areas, and groundwater recharge. The inflow of storm water during the northeast monsoon over hundreds of years has made the marsh a unique mix of freshwater (in the north) and brackish-estuarine water in the south. The marsh is home to about 45 species of fish, 10 species of frog, 21 species of reptiles (including the rare skink *Lygsoma albopunctata* a recent addition to Tamilnadu's reptilian fauna), 110 species of birds and 10 species of mammals. [ii] This includes the rare and almost extinct species of birds and animals too.

Besides the biodiversity richness, the Pallikaranai Marsh has immense ecosystem service value. It is the main outlet of the storm water that drains Madipakkam, Velachery, Taramani and the neighbouring suburbs. It has been a source of drinking water to people in the immediate neighbourhood, and has sustained agriculture for many centuries before degradation set in with Chennai's increasing profile as a metropolis. The total spread of the marsh was approximately 5500 ha (50 km^2) about 30 years ago. Years of encroachment on the marsh – construction of roads, buildings, houses, the metropolitan railway and dumping of garbage and sewage has shrunk the extent of the marshlands to 550 ha (a 90% decrease from the original size).[iii]

Garbage dumping and burning in the middle of and along the roads crisscrossing the marshes cause severe pollution, and hardship among local residents. Groundwater in several pockets around the marshlands are now contaminated. The rich organic content of the municipal waste degrades over time to release highly acid and toxic leachate. Dark pools of foul smelling streams common in the area around the garbage dump. Mass kills of frogs, fish and sometimes water birds has also been reported in

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i Minting Money from Garbage; Urban Finance, Quarterly Newsletter of NIVA, Vol. 4, No. 2. http://indiaurbaninfo.com/app/wsnsa.dll/niua/newssearch22.r?recno=81

i i Inland Wetlands of India – Tamil Nadu, 2000 2002; Care Earth; http://www.careearth.org/summary.html

i ii Inland Wetlands of India – Tamil Nadu, 2000 2002; Care Earth; http://www.careearth.org/summary.html

the area.[iv]

Most of the garbage is set ablaze after being dumped. Dozens of people, including children, rummage through the smouldering garbage mounds to collect items and material that can be reprocessed or re-sold. The smoke from burning garbage poses a serious health threat to both the people working in the dumping ground and residents of the area.

Air Sample:
On 28 September, 2005, a sample of air from a burning garbage heap from the Pallavaram Perungudi Road, about 50 metres across the road from the entrance to the Onyx dumping ground in Perungudi. The sample was taken in the presence of a representative of the Save Pallikaranai Marshland Forum. The sample was taken in a special Tedlar bag using a bucket as a container to house the bag, and couriered to Columbia Analytical Services in Simi Valley, California, for analyses of 69 volatile organic compounds and 20 sulphur gases as per established procedures of the US Environmental Protection Agency.

Conditions at the time of sampling: The wind direction at the time of the sampling was from South West to North East; the larger Perungudi dump used by Onyx was downwind of the sample site. White smoke from the waste dump was recorded and severe eye and throat irritation and breathlessness was reported by the sample-takers as a result of exposure to the smoke. The smell was identical to the smell of burning mixed garbage. The garbage contained organic matter (food waste etc) and a variety of packaging, including various plastics, tetrapacks, metal foils.

Findings:
Total of 27 chemicals were found in the sample. These include –

Hydrogen Sulphide	Carbonyl Sulphide	Methyl Mercaptan
Carbon Disulphide	Chloromethane	1,3-Butadiene
Chloroethane	Ethanol	Acetonitrile
Acrolein	Acetone	Trichlorofluoromethane
Methyl Ethyl Ketone	n-Hexane	Benzene
4-Methyl-2-Pentanone	Toluene	Chlorobenzene
Ethylbenzene	m,p-Xylenes	Styrene
o-Xylene	n-Nonane	Cumene
1,3,5-Trimethylbenzene	1,2,4-Trimethylbenzene	d-Limonene

- 15 out of 27 chemicals exceed the health-based standards set by United States Environmental Protection Agency Region 6 or other regulatory authorities
- 3 out of 27 chemicals (1,3-Butadiene, Benzene, Chloromethane) are known to cause cancer in humans and/or animal
    a) 1,3-Butadiene was found 34,782 times higher than the safe levels
    b) Benzene was found 2,360 times higher than the safe levels
    c) Chloromethane was found 209 times higher than the safe levels
- Out of the 27 chemicals found -- 24 chemicals target the Central Nervous System, 23 chemicals target the respiratory system, 22 chemicals target the eyes, 21 chemicals target the skin, 10 chemicals target the liver, 8 chemicals target the kidneys, 7 chemicals target the blood, 5 chemicals target the Cardio Vascular System and the reproductive system and 2 chemicals target the gastrointestinal system and the Peripheral Nervous System.

iv Inland Wetlands of India – Tamil Nadu, 2000 2002; Care Earth; http://www.careearth.org/summary.html

Table 1: List of Chemicals found in the air sample from garbage burning site

S No.	Chemical found	Levels detected (ug/m^3)	Regulatory limit (ug/m^3)	Number of times above the regulatory limit
1.	**Hydrogen Sulphide**	**58.2**	**1.0** (*USEPA Region 6 health based screening levels*)	**58.2**
2.	**Carbonyl Sulphide**	**34.8**	**8.0** (*Texas Short Term screening levels*)	**4.35**
3.	**Methyl Mercaptan**	**59.5**	**2.10** (*USEPA Region 6 health based screening levels*)	**28.3**
4.	**Carbon Disulphide**	**28**	**3** (*Texas Long Term screening levels*)	**9.3**
5.	**Chloromethane**	**230**	**1.1** (*USEPA Region 6 health based screening levels*)	**209**
6.	**1,3-Butadiene**	**240**	**0.0069** (*USEPA Region 6 health based screening levels*)	**34,782**
7.	**Chloroethane**	**14**	**2.3** (*USEPA Region 6 health based screening levels*)	**6.1**
8.	**Ethanol**	**530**	--	--
9.	**Acetonitrile**	**48**	**34** (*Texas Long Term screening levels*)	**1.4**
10.	**Acrolein**	**110**	**0.021** (*USEPA Region 6 health based screening levels*)	**5,238**
11.	**Acetone**	**480**	**370** (*USEPA Region 6 health based screening levels*)	**1.29**
12.	**Trichlorofluoromethane**	**20**	--	--
13.	**Methyl Ethyl Ketone**	**120**	**1000** (*USEPA Region 6 health based screening levels*)	--
14.	**n-Hexane**	**140**	**210** (*USEPA Region 6 health based screening levels*)	--
15.	**Benzene**	**590**	**0.25** (*USEPA Region 6 health based screening levels*)	**2,360**
16.	**4-Methyl-2-Pentanone**	**8.1**	**83** (*USEPA Region 6 health based screening levels*)	--
17.	**Toluene**	**300**	**188** (*Texas Long Term screening levels*)	**1.5**
18.	**Chlorobenzene**	**12**	**63** (*USEPA Region 6 health based screening levels*)	--
19.	**Ethylbenzene**	**81**	**1100** (*USEPA Region 6 health based screening levels*)	--
20.	**m,p-Xylenes**	**46**	--	--
21.	**Styrene**	**65**	**11** (*Texas Long Term screening levels*)	**5.9**
22.	**o-Xylene**	**28**	**730** (*USEPA Region 6 health based screening levels*)	--
23.	**n-Nonane**	**70**	--	--
24.	**Cumene**	**10**	**400** (*USEPA Region 6 health based screening levels*)	--
25.	**1,3,5-Trimethylbenzene**	**10**	**6.2** (*USEPA Region 6 health based screening levels*)	**1.6**
26.	**1,2,4-Trimethylbenzene**	**7.6**	**6.2** (*USEPA Region 6 health based screening levels*)	**1.22**
27.	**d-Limonene**	**53**	--	--

Comment:
Most of the chemicals found target the Central Nervous System and the Respiratory System. This is significant given the large residential population in the area. Even more distressingly, all the smouldering mounds of garbage are worked upon by armies of ragpickers – many of them children less than 14 years of age. Young children, whose immune and reproductive systems are not fully developed can suffer permanent effects from chronic exposure to such chemicals.

It is expected that the chemicals found in this sample may be typical of open household garbage burning. It takes on increased importance given the widespread nature of the practice in India and other industrializing countries. Open burning of garbage is prevalent in every part of the city and country. However, the composition of garbage burnt and the proportion of toxic material such as plastics, solvents and metals decides the toxicity of the ambient air. The nature of chemicals released are impossible to totally trap or destroy. Because they can cause harm at very low levels, it is best to not create them. Burning, in the open or in incinerators, is one sure way releasing these chemicals into the environment.

A ban on open burning is virtually impossible to enforce, especially in poor countries with large populations. Instead, it is recommended that the regulation be moved upstream to change the policies governing what material we use in society, particularly for packaging.

Based on the above analysis, it is important that the following steps are taken immediately:

1. **Stop all dumping, including by Onyx, municipalities, residences and residential associations, and commercial establishments in Pallikaranai marshlands:** The Government's proposal to restrict dumping to 200 acres and study the effects of continued sewage dumping on the marshlands is reflective of a primitive mindset. On the one hand, the Government seems to realise that the nature of garbage makes it virtually impossible to dispose in an environment- or people-friendly manner. On the other, it shies away from imposing any material use restrictions – such as anti-plastics regulations, material bans or even company take-back policies for toxic products such as tubelights, batteries and solvent or pesticide containers.

2. **Implement the Municipal Solid Waste Act:** This Act mandates household level segregation of garbage, and the collection of segregated garbage with different treatment, disposal options for different kinds of garbage. The implementation of this Act requires the Government to educate the citizens on source segregation and set up the infrastructure to collect and treat segregated garbage.

3. **Careful with the cures:** Landfilling and burning of municipal garbage (in the open or in incinerators) cause more problems than they solve. Incinerators, in particular, are sources of some of the most toxic chemicals known to science. The Government should seek solutions in segregation, and progressive materials use policies than in high-cost, high-tech incinerators.

4. **Composting:** Composting of biodegradable garbage should be prioritised at every level. Composting of pre-segregated garbage can result in the diversion of at least 60 percent waste from landfills.

More resources on the web on waste management and initiatives on waste reduction and effects of incineration:
www.thanal.org - Zero Waste Projects

www.exnora.org - Solid Waste Management
www.no-burn.org - Effects of Incineration
http://www.makingindiagreen.org/urbanwaste.htm